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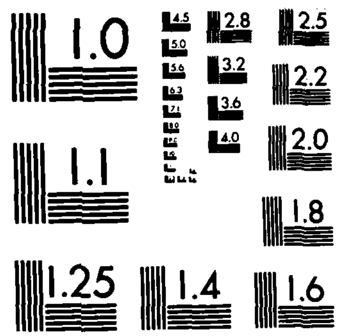

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STUDY REPORT
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TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)

AUGUST 1985

PREPARED BY
FORCE SYSTEMS DIRECTORATE

US ARMY CONCEPTS ANALYSIS AGENCY
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The study examined the Army FY 86 over ocean surface cargo transportation requirements measured in measurement tons per month. The study focused first on developing the FY 86 long range over ocean cargo forecast and subsequently assisted in installing a forecasting system at the Military Traffic Management Command.

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DEPARTMENT OF THE ARMY
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REPLY TO
ATTENTION OF

0 1 OCT 1985

CSCA-FSC

SUBJECT: Transportation Workload Forecasting - Implementation Project

Commander
Military Traffic Management Command
Falls Church, Virginia 22041-5050

1. The Commander, Military Traffic Management Command (MTMC), requested that the U.S. Army Concepts Analysis Agency (CAA) provide assistance in implementing a surface cargo forecasting system at MTMC and provide an FY 86 forecast of surface cargo requirements.

2. This report describes the FY 86 forecast, the methodology used to obtain the forecast, and the computer software which CAA transferred to MTMC to assist in implementing an over-ocean cargo forecasting capability.

E. B. Vandiver III

E. B. VANDIVER III
Director

TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)	STUDY SUMMARY CAA-SR-85-11

THE REASONS FOR PERFORMING THIS STUDY were:

(1) To develop a fiscal year (FY) 86 surface cargo forecast requested by the Military Traffic Management Command (MTMC). Transportation workload forecasts are statements of worldwide peacetime cargo lift requirements which are provided to the Military Sealift Command (MSC) and Military Airlift Command (MAC) by the shipper services. They state requirements in measurement tons by route, commodity, and program.

(2) To assist MTMC in the establishment of an operational forecasting capability using a combination of Box-Jenkins and Winters forecasting methods.

THE PRINCIPAL FINDINGS of the work reported herein are as follows:

(1) The Winters and Box-Jenkins forecasting methods were obtained by MTMC and their personnel trained in the logic and use of the forecasting methods.

(2) The FY 86 long-range surface forecast was produced and delivered to MTMC on 25 March 1985. A forecasting methodology consisting of computer programs and a data benchmark to test the programs was provided to MTMC on 7 June 1985.

(3) Postproduction analysis which utilized backcasting techniques was used to gauge the accuracy of the FY 86 forecast. The root mean square error (based on differences between observations and values predicted from the model) was the initial decision criterion for selecting the "better" forecasts from the two alternate methods.

THE MAIN ASSUMPTION was that the transportation workload forecasting requirements contained in Joint Chiefs of Staff (JCS) Publication 15 would remain unchanged.

THE PRINCIPAL LIMITATION to the forecasting method was that certain route-mode-commodity groups have insufficient shipping frequencies to utilize either the Box-Jenkins or the Winters forecasting methods to obtain usable forecasts.

THE SCOPE OF THE STUDY was to develop and provide an FY 86 long-range, over-ocean surface Army cargo forecast to MTMC and to assist MTMC in implementing a forecast system using the Winters and the Box-Jenkins methods of forecasting recommended by the US Army Concepts Analysis Agency (CAA) in the Transportation Workload Forecasting Study (TWFS).

THE STUDY OBJECTIVES were:

(1) Produce forecasts of 75 percent of the FY 86 ocean cargo requirements using the Box-Jenkins method and 98 percent of the FY 86 ocean cargo requirements using the Winters method.

(2) Assist MTMC to establish a forecasting system to enable them to produce the FY 87 forecast.

THE BASIC APPROACHES were:

(1) To obtain and evaluate cargo-lift data from FY 78 to FY 84 in order to determine which route-commodity-mode combinations occurred frequently enough to provide sufficient data points of monthly tonnages to make valid forecasts of future cargo requirements.

(2) To forecast cargo requirements on the retained routes using both Box-Jenkins and Winters forecasting methods, compare the two forecasts using the root mean square error criterion, and retain the route forecast which had the smaller discrepancies between observed values and those predicted from the model.

(3) To conduct postproduction analysis using backcasting methods which derived a FY 84 forecast for comparison with actual FY 84 movement data.

(4) To provide the forecasts, and the software which produced them, to MTMC to enable MTMC to reproduce the FY 86 forecasts and to use the same methods in future forecasting tasks.

THE STUDY SPONSOR was the Commander, Military Traffic Management Command.

THE STUDY EFFORT was directed by LTC James Keenan; and later, Mr. Harold D. Frear, Force Systems Directorate.

COMMENTS AND QUESTIONS may be addressed to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

Tear-out copies of this synopsis are at back cover.

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TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)

CHAPTER 1

INTRODUCTION

1-1. INTRODUCTION. The Department of Defense transports approximately 7.5 million tons of cargo annually via the Defense Transportation System (DTS). In excess of 50 percent of this cargo is generated by the Army. Planning for and use of military and commercial shipping is dependent on the accurate forecasting of measurement tons shipped per month by the Services.

1-2. BACKGROUND

a. Current forecasting procedures directed by Army Regulation (AR) 55-30 of Army cargo and mail workload requirements prescribe input from 17 major commands/agencies/activities worldwide. Transportation workload forecasts are statements of worldwide peacetime cargo lift requirements which are provided to the Military Sealift Command (MSC) and Military Airlift Command (MAC) by the shipper services. They state requirements in measurement tons by route, commodity, and program. These consolidated requirements are submitted by Headquarters, Department of the Army (HQDA) to MSC and MAC in accordance with Joint Chiefs of Staff (JCS) Publication 15. MSC, Military Traffic Management Command (MTMC), and MAC utilize this data to generate their industrial fund budgets. History reveals significant variances in forecasted surface requirements versus actual lift, which results in distorted budgets by both the shipper service and MSC and MTMC.

b. The US Army Concepts Analysis Agency (CAA) conducted a study of the current system (Transportation Workload Forecasting Study (TWFS), CAA-SR-84-2, January 1984) and concluded that more accurate and efficient forecasting could be achieved. Essential to improving forecasting was performing this function at a single location and using the Box-Jenkins method or the Winters Model as the principal tool. CAA agreed to provide assistance to implement the forecasting system at the designated agency.

c. The Office of the Deputy Chief of Staff for Logistics (ODCSLOG) directed that the Military Traffic Management Command (MTMC) perform the over-ocean cargo forecasting for the Army. MTMC requested CAA to assist them in their preparation of the FY 86 forecast due in March 1985.

1-3. PURPOSE AND SCOPE. This study developed the FY 86 long-range surface cargo over-ocean forecasts and assisted MTMC in their implementation of a forecasting system. The project focused first on developing the FY 86 long-range over-ocean surface cargo forecast and subsequently implemented a forecasting system using the Winters Model and the Box-Jenkins method at MTMC. The forecasting methods are general in application, but air and ground cargo forecasting are not considered in this application.

1-4. OBJECTIVES. The study objectives were to:

a. Forecast 75 percent of the FY 86 over-ocean surface cargo lift requirement using the Box-Jenkins method and 98 percent using the Winters Model.

b. Assist MTMC in impleme ting a surface sealift cargo forecasting system at MTMC to produce the FY 87 forecasts.

1-5. LIMITATIONS. The principal limitation to the forecasting method was that certain route-commodity-mode groups have insufficient measurement tons shipped per month to obtain useable forecasts.

1-6. ESSENTIAL ELEMENTS OF ANALYSIS (EEA). The elements of analysis were keyed to producing a FY 86 forecast and transferring the method used to produce that forecast to MTMC.

a. What over-ocean cargo lift requirements can be accurately predicted by route between shipping areas, by commodity and by mode, given the available data?

b. What are the forecasts for over-ocean sealift requirements for FY 86 using the Winters Model and the Box-Jenkins method?

c. What programs developed by CAA are required by MTMC to produce future forecasts?

d. What statistical packages containing forecasting models or methods are available for use for the computer facilities at MTMC?

e. What actions must MTMC accomplish to develop a system for the production of future forecasts?

1-7. STUDY TASKS. To fulfill the study objectives and to answer the elements of analysis, seven principal tasks were identified and were to be the basis for the study methodology. These tasks were:

a. Obtain and evaluate cargo lift data from FY 78 to FY 84 to determine its suitability to produce specific route forecasts.

b. Determine the number of route forecasts that can be produced prior to 1 March 1985.

c. Produce, compare, and analyze forecasts of over-ocean cargo lift requirements using the Box-Jenkins method and the Winters Model.

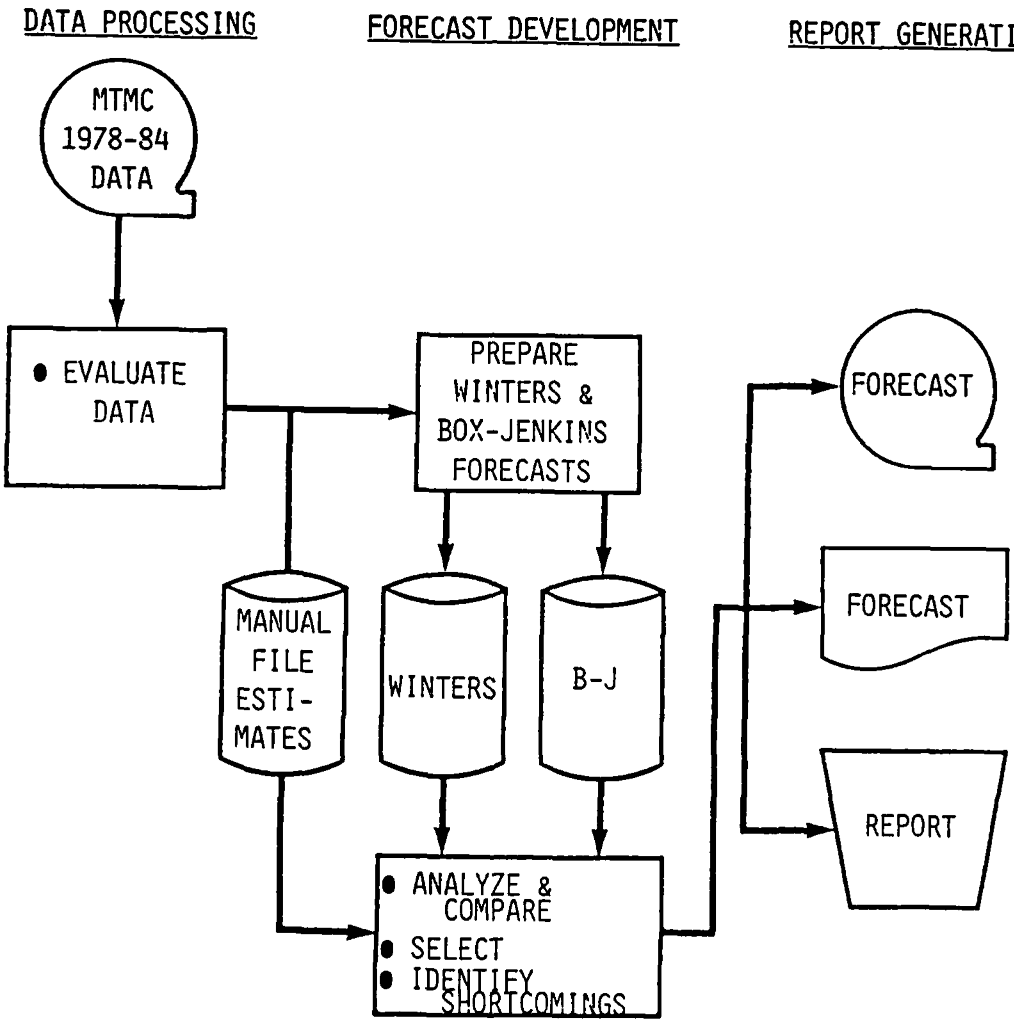
d. Deliver forecasts on magnetic tape in prescribed format to MTMC.

e. Provide a report to MTMC containing the FY 86 long-range forecast, the forecast model parameters, the Winters Model program, and an audit trail of the generation of the FY 86 long-range forecasts.

f. Assist MTMC to implement an over-ocean cargo forecasting system.

g. Publish final report.

1-8. STUDY METHODOLOGY. The methodology used in the study is depicted in Figure 1-1.



B-J = BOX-JENKINS

Figure 1-1. Study Methodology

a. Activities in the evaluation of cargo lift data consisted of the following:

(1) Obtained 1978-1984 cargo data from MTMC/MSC files.

(2) Sorted data by route, commodity, mode, and month.

(3) Examined data for forecasting suitability.

(4) Identified alternative methodologies for those routes-commodities-modes not suitable for Box-Jenkins/Winters methods. Last year actual movements were used in most instances.

b. Activities in determining the number of route forecasts possible included the following:

(1) Prioritized routes to be forecast by total tonnage.

(2) Identified routes-commodities-modes that could be forecast by 1 March 1985.

(3) Coordinated forecast responsibilities with MTMC.

c. Activities in producing and comparing forecasts included the following:

(1) Produced Winters forecasts.

(2) Produced Box-Jenkins forecasts.

(3) Compared both forecasts to each other and to historic data.

(4) Selected forecast for each route.

d. Activities in producing and delivering forecasts included the following:

(1) Produced copies of completed forecasts weekly.

(2) Produced computer tape containing FY 86 forecast in AR 55-23 format and delivered forecast to MTMC.

e. Activities in assisting MTMC to implement an over-ocean forecasting system were as follows:

(1) Provided MTMC computer analyst with data processing requirements.

(2) Provided MTMC statistician/analyst with Box-Jenkins and Winters forecasting processes.

(3) Identified and transferred data processing routines and Winters program to MTMC.

(4) Assisted in testing of Winters Model and data processing routines at MTMC.

(5) Identified sources of statistical packages containing Box-Jenkins method for MTMC computers.

(6) Assisted MTMC in reproduction of FY 1986 forecast at MTMC.

1-9. STUDY PRODUCTS AND GUIDE TO THE REMAINDER OF THE REPORT. The TWFS-I Study produced four study products: (1) the FY 86 surface cargo forecast, (2) an audit trail of the method used to produce the FY 86 forecast, (3) this study report, and (4) consulting as required by MTMC to establish a forecasting capability.

a. The FY 86 forecast delivered 25 March 1985, contained 562 individual route forecasts. Of these, 42 routes were Box-Jenkins forecasts and 462 were Winters forecasts. The remaining 58 routes used MTMC-provided forecasts. The Box-Jenkins route forecasts are shown in Appendix H. The Winters forecasts are shown in Appendix F. Chapter 4 contains the results of the forecasts and postproduction analysis completed to provide a quality assurance check of the forecast provided to MTMC.

b. An audit trail of the method used to produce the forecasts was provided to MTMC. This audit trail contained data base software, forecasting software, and integration software. The data base software and data benchmarks for that software are shown in Appendix E. The forecasting software and the data benchmarks are shown in Appendix I for the Box-Jenkins method, and in Appendix G for the Winters Model. The integration software selected each route forecast included in the FY 86 cargo forecast. The integration software and data benchmarks are shown in Appendix J.

c. Chapter 2 provides an illustrative Winters forecast, and Chapter 3 presents an illustrative Box-Jenkins forecast. Chapter 5 addresses the essential elements of analysis, while Chapter 6 presents study findings.

CHAPTER 2

WINTERS MODEL

2-1. BACKGROUND. The purpose of this chapter is to describe the Winters Model as a method of producing forecasts from time series data. Historically, the fitting of systematic functions to observations has typically relied on least-squares criteria in which all the observations are given equal weight. However, it is often the case, when data is being observed as a function of time, that more weight should be given to the recent past, and that observations taken a long time ago should be discounted in comparison. In 1957, C. C. Holt published a paper entitled "Forecasting Seasonals and Trends by Exponentially-weighted Moving Averages." The procedure proposed therein addressed development of a set of weights proportional to powers of a parameter β, where β was defined to be greater than zero but less than unity. Thus, the set of weights were $1, \beta, \beta^2$, etc. Constraints were imposed whereby the sum of the weights must equal unity and β must serve to minimize the mean square error. Holt ultimately considered two parameters, the import of the second being to account for a trend in the data. In 1960, P. R. Winters extended Holt's method to cover seasonal effects. Thus, the model for which he is responsible is a three-parameter model.

2-2. EXAMPLE. The Winters Model owes its development primarily to the fact that there are many time series that cannot be adequately modeled by a polynomial. Time series with cyclical or seasonal variations fall into this category. For example, at least a cubic equation (which has a single point of inflection between regions of upward and downward concavity) is required to capture the cyclical pattern of periodic data. Furthermore, from an applications viewpoint, many industrial time series exhibit seasonal behavior. The quantities of many of the commodities shipped around the world by the Army exhibit seasonality in their time series. For example, Figure 2-1 shows the Winters forecast for FY 84 corresponding to commodities falling under the Army's general cargo classification. The forecast was developed by applying Winters' method to 5 years of data (FY 79 through FY 83). Note that the shape of the forecast for FY 84 corresponds closely to the profile of actual cargo shipments for that timeframe. A great deal of activity takes place during the spring and summer months, while fewer shipments are made during the fall and winter. The separation between the two curves is due to an abrupt increase in the amount of general cargo shipped by the Army during FY 84. The overall high level of general cargo shipments witnessed during FY 84 did not take place during the 5 preceding years, but the upward trend will be captured by the Winters Model when forecasts are developed for years subsequent to FY 84.

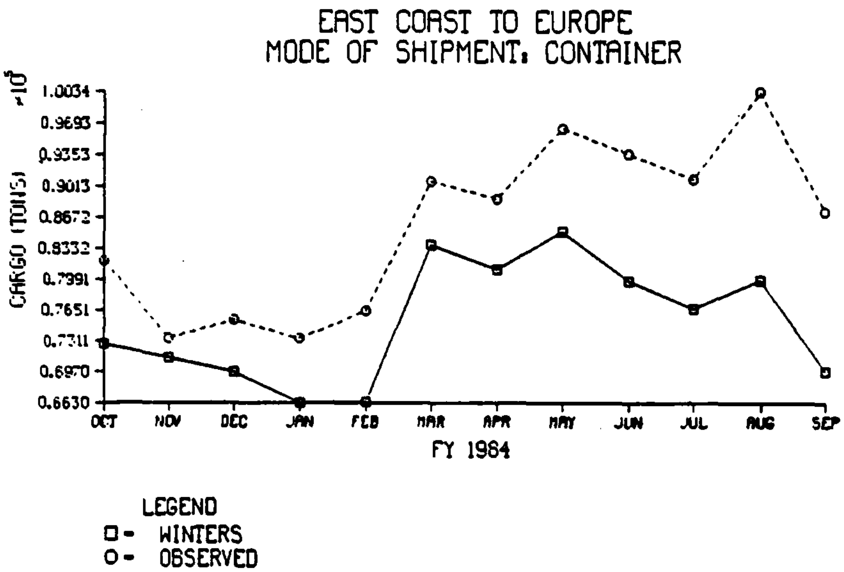


Figure 2-1. General Cargo Forecast - Lift, FY 84

2-3. GENERAL FORM. The general form of the Winters Model expresses an observation x_t at time t as:

$$x_t = (a_1 + b_2 t)c_t + \epsilon_t \qquad (2\text{-}1)$$

The three parameters of the model are a_1, b_2, and c_t, while the term ϵ_t is taken to represent the usual random error component. The parameter a_1 is called the permanent component and is analogous to a y-intercept. Similarly, the parameter b_2, or trend factor, corresponds to the slope of a simple linear equation. The third parameter, c_t, represents a set of seasonal factors for each cycle. The seasonal factors induce fluctuations above and below the line segments that are fitted to each cycle. The Winters Model, as described herein, is a multiplicative seasonal model, so named because the seasonal parameter c_t is applied multiplicatively, not additively. Multiplicative seasonal models are most appropriate for time series in which the amplitude (or excursion) of the seasonal pattern is proportional to the average level of the series. This pattern was evident in the TWFS-I data.

2-4. SPECIFIC FORM. The specific form of the Winters prediction equation is:

$$\hat{x}_{T+\tau}(T) = \left[\hat{a}_1(T) + \hat{b}_2(T)\tau\right]\hat{c}_{T+\tau}(T+\tau-L) \tag{2-2}$$

where, conventionally, carats are used to denote estimates. The equation gives the forecast at time T for an observation at time $T+\tau$. Quantities in parentheses indicate the times of computation of the estimates. Thus, in order to forecast period $T+\tau$, the seasonal factor which was computed one season (L periods) ago in period $T+\tau-L$ must be used.

2-5. PARAMETERS. As mentioned earlier, the three parameters of the Winters Model are the permanent component, the trend component, and the seasonal factor. Estimates of these parameters for the period T are weighted and combined with estimates from previous periods. The manner in which the current estimate of a parameter is apportioned with respect to a previous value is such that the mean square error is minimized over the entire time series. Smoothing constants (or weights) are used to apportion present and past estimates. For example, if the smallest mean square error were produced by a weight of 0.80 for the current estimate of a parameter and 0.20 for the previous estimate of the parameters, then this would mean simply that the current estimate is four times as important in the parameter updating process as the previous estimate.

a. Permanent Component. The estimate of the permanent component is updated by:

$$\hat{a}_1(T) = \alpha \frac{x_T}{\hat{c}_T(T-L)} + (1-\alpha)\left[\hat{a}_1(T-1) + \hat{b}_2(T-1)\right] \tag{2-3}$$

where $0 \leq \alpha \leq 1$. Note that the value of x_T is divided by $\hat{c}_T(T-L)$, which is the estimate of the seasonal factor for period T computed one season (L periods) ago. This is done in order to eliminate seasonal fluctuations from x_T, i.e., to deseasonalize the current observation. The deseasonalized observation is then combined with the contribution of the permanent component and trend for the previous period T-1. This shifts the origin of time to the end of the current period. The adjustment for seasonality can best be understood by considering the case when $\hat{c}_T(T-L)$ is greater than 1. This occurs when the value in period T-L is greater than average in its seasonality. Dividing x_T by this number greater than 1 gives a value that is smaller than the original value by a percentage just equal to the amount that the seasonality of period T-L was higher than the average. Of course, the opposite adjustment occurs when the seasonality number is less than unity. It should be noted that the reason for using the seasonal factor from the previous season (L periods ago) is that the seasonal factor for the current season cannot be computed until the permanent component itself is calculated.

b. Trend Component. The estimate of the trend component is updated by:

$$\hat{b}_2(T) = \beta[\hat{a}_1(T) - \hat{a}_1(T-1)] + (1-\beta)\hat{b}_2(T-1) \tag{2-4}$$

where $0 \leq \beta \leq 1$. This equation is exactly as Holt's equation for smoothing the trend. The estimate of the trend component is simply the smoothed difference between two successive estimates of the permanent component. The procedure of determining the trend component is similar to evaluating the slope of a line segment, where the end points of the line segment correspond to the beginning and end of the period T.

c. Seasonal Factor. The estimate of the seasonal factor is updated by:

$$\hat{c}_T(T) = \gamma \frac{x_T}{\hat{a}_1(T)} + (1-\gamma)\hat{c}_T(T-L) \tag{2-5}$$

where $0 \leq \gamma \leq 1$. This equation specifies the seasonal index as the ratio of the current value of the series, x_T, to the current smoothed value for the series, $\hat{a}_1(T)$. If x_T is larger than $\hat{a}_1(T)$, the ratio will be greater than 1, while if it is smaller than $\hat{a}_1(T)$, the ratio will be less than 1. It is important to understand that $\hat{a}_1(T)$ is a smoothed average value of the series that does not include seasonality. The values of x_T, however, do contain seasonality (as well as randomness). Notice that equation (2-5) smooths (weights) the current observed seasonal variation ($x_T/a_1(T)$) with the estimate of the seasonal factor for period T computed L periods ago. That was the last opportunity to observe this portion of the seasonal pattern.

2-6. INITIALIZATION. The previous section discussed the procedure for updating the parameters (permanent component, trend, and seasonal factor), given that initial values exist. Upon option, initial estimates of the Winters Model parameters can be specified by the user. Alternatively, several heuristic algorithms have been devised to initialize parameters based on manipulation of historical data. The initialization procedure described below is due to Montgomery and is similar to the one proposed by Winters.

a. Trend Component. Assuming that data are available for m seasons, then compute the mean of all observations for the first and last of these seasons. Denote the average observation for the jth season by $\bar{x}_j$, j = 1,2,...,m. Estimate the trend in the same manner that would be used to compute a simple algebraic slope. Since there are m-1 seasons between season 1 and season m, and since there are L periods per season, then the initial estimate of the trend becomes:

$$\hat{b}_2(0) = \frac{\bar{x}_m - \bar{x}_1}{(m-1)L} \tag{2-6}$$

b. Permanent Component. For initialization purposes, it is assumed that the average observation $\bar{x}_1$ for the first season occurs timewise at the middle of the season. With this in mind, the permanent component can be treated like a simple y-intercept. Writing the equation in slope-intercept form gives:

$$\bar{x}_1 = \hat{a}_1(0) + \frac{L}{2}\hat{b}_2(0) \tag{2-7}$$

Since all terms are known except for the permanent component, equation (2-7) can be rewritten as:

$$\hat{a}_1(0) = \bar{x}_1 - \frac{L}{2}\hat{b}_2(0) \tag{2-8}$$

c. Seasonal Factor. Since there are m seasons and L periods per season, seasonal factors are computed initially for each of the mL periods. Each factor is computed as the ratio of the actual observation to the average seasonally adjusted value for that season, further adjusted by the trend. The computation is:

$$\hat{c}_t = \frac{x_t}{\bar{x}_i - ((L+1)/2 - j)\hat{b}_2(0)} \qquad t = 1,2,\ldots mL \tag{2-9}$$

where $\bar{x}_i$ is the average for a season corresponding to the t index, and j is the position of period t within the season. For example, if $1 \leq t \leq L$, then $i = 1$, and if $L + 1 \leq t \leq 2L$, then $i = 2$. Equation (2-9) produces m estimates of the seasonal factor for each period. (In the TWF Study, m was usually 5, and there were five estimates for each month of the year.) The m estimates for each period (month) are averaged to produce a single estimate of the seasonal factor for each period within the season.

$$\bar{c}_t = \frac{1}{m}\sum_{k=0}^{m-1}\hat{c}_{t+kL} \qquad t = 1,2,\ldots,L \tag{2-10}$$

Finally, the seasonal factors are normalized so that they sum to L (L = 12 in the study).

$$\hat{c}_t(0) = \bar{c}_t \frac{L}{\sum_{t=1}^{L} c_t} \qquad t = 1,2,\ldots L \qquad (2\text{-}11)$$

The above procedure produces estimates $\hat{a}_1(0)$, $\hat{b}_2(0)$, and $\hat{c}_t(0)$ assuming that the origin of time is immediately prior to period 1. The parameters may then be updated by the technique described in paragraph 2-5 of this report.

2-7. SMOOTHING CONSTANTS. Smoothing constants are necessary in order to combine (weight) previous estimates of parameters with their updated values. Numerical estimates of the permanent component, trend component, and seasonal factor receive the weights α, β, and γ for the current interval T. These weighted estimates are combined additively with complementary weighted values (using $1-\alpha$, $1-\beta$, and $1-\gamma$) for the previous time period or season, as appropriate. All weights are varied incrementally so that the parameters of the model ultimately provide the best fit according to some predetermined criterion, i.e., mean square error. Unlike the formal method of least squares, which uses partial derivatives to develop a set of simultaneous linear equations (normal equations) that are solved through matrix inversion, the Winters method is heuristic in nature. As such, the optimum set of smoothing constants is determined by trial and error. The coefficients lie in the interval (0,1). In order to keep computer time requirements modest, a coarse grid is tried first. Values of α, β, and γ are stepped across the unit interval in increments of 0.05 until all possible combinations of smoothing constants have been examined. The set of (α, β, γ) producing the smallest mean square error is used in the program as the basis for a second, fine-grained search. A step of 0.01 is used to search in a narrow interval about the coarse estimates of (α, β, γ) to yield refined values of the smoothing constants.

2-8. NUMERICAL COMPUTATIONS. Having defined the specific form of the Winters prediction equation and its associated parameters, numerical computation can be more readily understood. The first output generated by the Winters program are rank-ordered smoothing constants. Figure 2-2 shows the 40 best triplets of smoothing constants for the example given as Figure 2-1. The criterion used is the residual sum of squares (root mean square (RMS) error) for the 60 data points preceding the forecast of Figure 2-1. Note that the smoothing constant triplet at the top of Figure 2-2 produces the optimum fit, since it has the smallest RMS error associated with it. Figure 2-3 presents the values of the Winters parameters (permanent component, trend, and seasonal factor) up to the beginning of the forecast interval. In addition to the raw observations, Figure 2-3 also includes the fitted model values corresponding to the optimum smoothing constant triplet. Figure 2-4 displays the output of the forecasting phase. For a computational example, consider the forecast of 69,852.86 tons for month 72. Since the forecast lead time is 12 months, revert to the parameters shown at the bottom of Figure 2-3 at month 60. Using equation 2-2 yields:

$$\hat{X}_{72}(60) = (75266.8066 - 3.2324\ (12))\ 0.9285$$

$$= 69{,}849.21 \text{ tons}$$

which is very close to the Figure 2-4 number.

SMOOTHING CONSTANT OPTIMIZATION ROUTINE

ALPHA	BETA	GAMMA	RESIDUAL SUM OF SQUARES
.0000	.7400	.0000	.4445139+010
.0000	.7500	.0000	.4445145+010
.0000	.7400	.0100	.4491178+010
.0000	.7500	.0100	.4491184+010
.0000	.7400	.0200	.4536824+010
.0000	.7500	.0200	.4536830+010
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.0000	.7400	.0400	.4626807+010
.0000	.7500	.0400	.4626813+010
.0100	.7400	.0000	.5860540+010
.0100	.7400	.0100	.5865487+010
.0100	.7400	.0200	.5871643+010
.0100	.7500	.0000	.5872867+010
.0100	.7500	.0100	.5878764+010
.0100	.7400	.0300	.5879005+010
.0100	.7500	.0200	.5885905+010
.0100	.7400	.0400	.5887527+010
.0100	.7500	.0300	.5894165+010
.0100	.7500	.0400	.5903578+010
.0200	.7400	.0000	.9565191+010
.0200	.7400	.0100	.9598997+010
.0200	.7400	.0200	.9632839+010
.0200	.7400	.0300	.9666793+010
.0200	.7400	.0400	.9700808+010
.0200	.7500	.0000	.9713443+010
.0200	.7500	.0100	.9747131+010
.0200	.7500	.0200	.9780895+010
.0200	.7500	.0300	.9814713+010
.0200	.7500	.0400	.9848704+010
.0300	.7400	.0000	.1457306+011
.0300	.7400	.0100	.1461150+011
.0300	.7400	.0200	.1465061+011
.0300	.7400	.0300	.1469034+011
.0300	.7400	.0400	.1473073+011
.0300	.7500	.0000	.1480419+011
.0300	.7500	.0100	.1484333+011
.0300	.7500	.0200	.1488379+011
.0300	.7500	.0300	.1492355+011
.0300	.7500	.0400	.1496466+011

THE OPTIMUM SMOOTHING CONSTANTS ARE

ALPHA = .0000 BETA = .7400 GAMMA = .0000

Figure 2-2. Rank-ordered Smoothing Constants

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OUTPUT OF THE INITIALIZATION PHASE

PERIOD	OBSERVATION	PERMANENT COMPONENT	TREND	SEASONAL FACTOR	FITTED MODEL	RESIDUAL
1	67325.46	75457.7324	-3.2393	.9674	.00	.00
2	73538.06	75454.4932	-3.2393	.9471	.00	.00
3	69261.84	75451.2539	-3.2393	.9264	.00	.00
4	66269.29	75448.0146	-3.2393	.8810	.00	.00
5	61699.29	75444.7754	-3.2393	.8828	.00	.00
6	91636.67	75441.5361	-3.2393	1.1129	.00	.00
7	76099.46	75438.2969	-3.2393	1.0777	.00	.00
8	77530.18	75435.0586	-3.2385	1.1331	.00	.00
9	86640.30	75431.8203	-3.2383	1.0602	.00	.00
10	86424.61	75428.5820	-3.2383	1.0197	.00	.00
11	91607.00	75425.3437	-3.2383	1.0630	.00	.00
12	62266.28	75422.1055	-3.2383	.9285	.00	.00
13	64026.83	75418.8672	-3.2383	.9674	72963.39	-8936.56
14	79626.68	75415.6289	-3.2383	.9471	71422.96	8203.72
15	74592.92	75412.3906	-3.2383	.9264	69865.67	4727.25
16	58656.85	75409.1523	-3.2383	.8810	66437.09	-7780.24
17	62943.92	75405.9150	-3.2376	.8828	66569.36	-3625.[illegible]
18	66106.29	75402.6777	-3.2374	1.1129	83919.24	-17812.[illegible]5
19	71346.12	75399.4404	-3.2373	1.0777	81257.76	-9911.64
20	66534.10	75396.2031	-3.2373	1.1331	85433.76	1100.34
21	76593.84	75392.9658	-3.2373	1.0602	79932.33	-3338.49
22	71131.09	75389.7285	-3.2373	1.0197	76874.93	-5743.84
23	76469.60	75386.4912	-3.2373	1.0630	80134.46	-3664.87
24	69299.33	75383.2539	-3.2373	.9285	69997.00	-697.67
25	77768.73	75380.0176	-3.2366	.9674	72925.80	4842.93
26	56129.30	75376.7812	-3.2364	.9471	71386.17	-15256.87
27	67723.58	75373.5449	-3.2363	.9264	69829.67	-2106.09
28	53093.01	75370.3086	-3.2363	.8810	66402.86	-13309.85
29	64063.76	75367.0723	-3.2363	.8828	66535.07	-2471.31
30	78673.77	75363.8359	-3.2363	1.1129	83876.02	-5202.25
31	70525.34	75360.5996	-3.2363	1.0777	81215.91	-10690.57
32	81859.31	75357.3633	-3.2363	1.1331	85389.75	-3530.44
33	67286.48	75354.1279	-3.2356	1.0602	79891.15	-12604.67
34	65817.64	75350.8926	-3.2354	1.0197	76835.32	-11017.68
35	73548.73	75347.6572	-3.2354	1.0630	80093.18	-6544.45
36	68476.81	75344.4219	-3.2354	.9285	69960.94	-1484.13
37	70710.87	75341.1865	-3.2354	.9674	72888.23	-2177.36
38	64759.55	75337.9512	-3.2354	.9471	71349.40	-6589.85
39	68605.07	75334.7158	-3.2354	.9264	69793.71	-1188.64
40	71810.79	75331.4805	-3.2354	.8810	66368.66	5442.13
41	64915.22	75328.2461	-3.2346	.8828	66500.79	-1585.57
42	82282.37	75325.0117	-3.2344	1.1129	83832.81	-1550.44
43	94601.45	75321.7773	-3.2344	1.0777	81174.07	13427.38
44	92448.17	75318.5430	-3.2344	1.1331	85345.75	7102.42
45	88701.98	75315.3086	-3.2344	1.0602	79850.00	8851.98
46	88558.34	75312.0742	-3.2344	1.0197	76795.75	11762.59
47	82346.96	75308.8398	-3.2344	1.0630	80051.92	2295.04
48	68936.66	75305.6055	-3.2344	.9285	69924.90	-988.24
49	76386.44	75302.3711	-3.2344	.9674	72850.68	3535.76
50	75482.33	75299.1377	-3.2337	.9471	71312.63	4169.70
51	65870.83	75295.9043	-3.2335	.9264	69757.75	-3886.92
52	76479.87	75292.6709	-3.2334	.8810	66334.46	10145.41
53	71805.40	75289.4375	-3.2334	.8828	66466.53	5338.87
54	92499.86	75286.2041	-3.2334	1.1129	83789.62	8710.24
55	86262.80	75282.9707	-3.2334	1.0777	81132.25	5130.55
56	79338.41	75279.7373	-3.2334	1.1331	85301.79	-5963.38
57	72820.75	75276.5039	-3.2334	1.0602	79808.86	-6988.11
58	65275.25	75273.2715	-3.2327	1.0197	76756.18	-11480.93
59	68261.94	75270.0391	-3.2325	1.0630	80010.67	-11748.73
60	72948.60	75266.8066	-3.2324	.9285	69888.87	3059.73

SUM OF RESIDUALS = -92032.13 AVERAGE RESIDUAL = -1533.87 VARIANCE = ********** STANDARD DEVIATION = 6739.59

MEAN ABSOLUTE DEVIATION = 5128.74

NUMBER OF RESIDUALS EXCEEDING TWO STANDARD DEVIATIONS = 2

Figure 2-3. Output of Initialization Phase

OUTPUT OF FORECASTING PHASE

LENGTH OF THE SEASON IS 12 PERIODS   FORECAST LEAD TIME IS 12 PERIODS

PERIOD	OBSERVATION	PERMANENT COMPONENT	TREND	SEASONAL FACTOR	FORECAST	ERROR	TRACKING SIGNALS CUM. ERROR	TRACKING SIGNALS SMOOTHED ERROR
61	81982.55	75263.5742	-3.2324	.9674	72813.14	9169.41	1.6573	.1657
62	73439.30	75260.3418	-3.2324	.9471	71275.90	2163.40	2.1811	.2005
63	75450.33	75257.1094	-3.2324	.9264	69721.81	5728.52	3.2503	.2877
64	73401.27	75253.8770	-3.2324	.8810	66300.29	7100.98	4.4462	.3808
65	76511.07	75250.6445	-3.2324	.8828	66432.28	10078.79	5.8048	.4866
66	90740.98	75247.4131	-3.2317	1.1129	83746.45	6994.54	6.8631	.5464
67	88776.23	75244.1816	-3.2315	1.0777	81090.44	7685.79	7.9211	.6028
68	96422.41	75240.9502	-3.2315	1.1331	85257.83	11164.58	9.0017	.6692
69	93673.73	75237.7187	-3.2314	1.0602	79767.73	13906.00	10.0016	.7314
70	90931.91	75234.4873	-3.2314	1.0197	76716.63	14215.28	10.9171	.7787
71	100337.69	75231.2559	-3.2314	1.0630	79969.45	20368.24	11.6640	.8271
72	87389.55	75228.0244	-3.2314	.9285	69852.86	17536.69	12.4476	.8570

SUM OF FORECAST ERRORS = 126112.21   MEAN FORECAST ERROR = 10509.35   VARIANCE =**********   STANDARD DEVIATION = 5211.15

ROOT MEAN SQUARE ERROR = 11633.55   MEAN OBSERVATION = 85754.75

MEAN ERROR AS FRACTION OF MEAN OBSERVATION = .1226   RMS ERROR AS FRACTION OF MEAN OBSERVATION = .1357

Figure 2-4. Output of Forecasting Phase

CHAPTER 3

THE BOX-JENKINS FORECAST METHOD WITH AN EXAMPLE

3-1. BOX-JENKINS MODELING APPROACH

a. **Background.** Box-Jenkins models are a unique set of linear time series models used to model stochastic time series data. Box-Jenkins models fall into three classes: autoregressive (AR), moving average (MA), and mixed (ARMA). Box-Jenkins models find their origin in the AR models that were first introduced by Yule (1927) and later generalized by Walker (1931). MA models were first developed by Slutzky (1937), and ARMA models were initially theorized by the work of Wold (1938). George Box and Gwilym Jenkins are responsible for collating these previous works and establishing an approach to apply these models. The Box-Jenkins approach consists of three steps (see Figure 3-1).

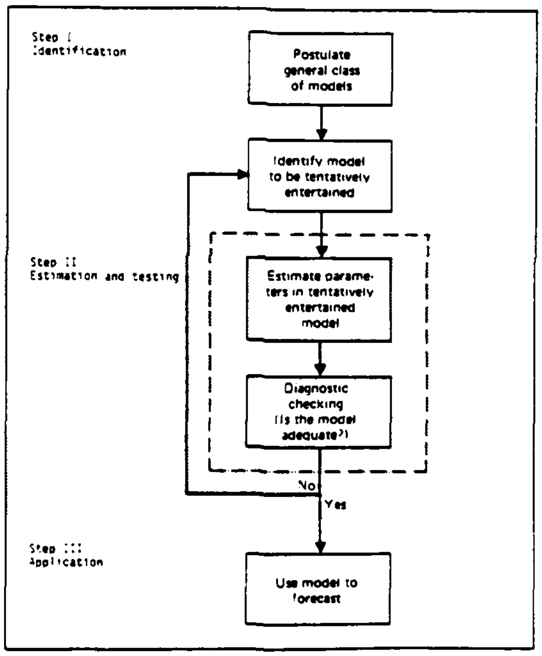


Figure 3-1. Box-Jenkins Modeling Approach

(1) **Identification.** The first step in applying the Box-Jenkins methodology is to identify the degree of homogeneity in the data, i.e., how many times the series must be differenced to achieve stationarity. Once the degree of homogeneity is established, the data pattern is identified as AR, MA, or ARMA.

(2) Estimation. After the data pattern is correctly identified, parameter estimates for AR, MA, or ARMA model are generated to obtain a model that best fits the data.

(3) Verification. Finally, test runs using the estimated model parameters are conducted. The results and diagnostic checks are performed on the model parameter estimates and residual estimates to ensure goodness of fit and adequacy of the model. The predictive value of the model can be evaluated and analyzed using historical data that is not used to develop the original model. If the model is not adequately verified, then steps 1 through 3 are repeated until an appropriate model is identified.

b. Stationarity. The most crucial element in applying Box-Jenkins models is the principle of stationarity. Stationary data are defined as data that are invariant with respect to time. A stationary data series is characterized by a constant mean, variance, and covariance throughout the series, i.e., no change over time.

c. Data Transformations. It is uncommon for a data series existing in its natural form to be stationary. Thus, the data must be transformed to achieve stationarity. Three major statistical transformations are especially useful in achieving stationarity: (1) differencing the series, (2) applying natural log transformations to the series, and (3) applying a square root power transformation to the series. If these techniques do not produce stationary data, then differencing of the logged series or differencing of the squared series can be attempted. Model applications to differenced series are referred to as ("I") and the "ARMA" notation is expanded to "ARIMA".

d. Box-Jenkins Models. Once stationarity is achieved, the data is modeled using the three general classes of Box-Jenkins models: AR, MA, or ARMA.

(1) Autoregressive (AR) Models. AR models follow the general form

$$x_t = \delta + \phi_1 x_{t-1} + \phi_2 x_{t-2} + \ldots + \phi_n x_{t-n} + \epsilon_t$$

where δ is drift, x_t are the dependent observations of the series, ϕ_n are the regression estimates of the model, and ϵ_t is the error term. The most common models are the AR(1) model

$$x_t = \delta + \phi_1 x_{t-1} + \epsilon_t$$

and the AR(2) model

$$x_t = \delta + \phi_1 x_{t-1} + \phi_2 x_{t-2} + \epsilon_t$$

Autoregressive models differ from the general regression equations in that there are no independent variables to regress upon. The regression is performed on past values of the dependent variable, thus the term autoregressive.

(2) **Moving Average (MA) Models.** MA models follow the general form

$$x_t = \mu + \epsilon_t - \theta_1\epsilon_{t-1} - \theta_2\epsilon_{t-2} - \dots - \theta_n\epsilon_{t-n}$$

where μ is the mean of the series, ϵ_t are the past error terms, and θ_n are the parametric estimates of the model. The most common form of MA models is the MA(1) model

$$x_t = \mu + \epsilon_t - \theta_1\epsilon_{t-1}$$

and the MA(2) model

$$x_t = \mu + \epsilon_t - \theta_1\epsilon_{t-1} - \theta_2\epsilon_{t-2}$$

Unlike the AR models which are a linear function of past observations, MA models are a linear combination of past errors. Also, unlike the general moving average models where the sum of parameters equals 1 ($\theta_1 + \theta_2 + \dots \theta_n = 1$), Box-Jenkins MA model parameters do not necessarily add up to 1. Finally, the error terms of the model are assumed to be distributed normally with a mean of zero (0) and a constant variance (σ^2).

(3) **Autoregressive-Moving Average (ARMA) Models.** ARMA models are combination models which are derived from the following equality:

$$\phi(B)\, x_t = \theta(B)\, \epsilon_t$$

where ϕ and θ are the AR and MA parameters, x_t and ϵ_t are the past observations and error terms, and B is the backshift operator $Bx_t = x_{t-1}$. In essence, this equality states that a complex AR process can be expressed as an MA process of infinite order and vice versa. The resultant of this equality is the general equation for forecasting X_t:

$$X_t = \phi_1 x_{t-1} + \dots + \phi_n x_{t-n} + \delta + \epsilon_t - \theta_1\epsilon_{t-1} - \dots - \theta_n\epsilon_{t-n}$$

The combination of AR and MA terms produces a model that is more accurate than the pure MA or AR models. Furthermore, in combining the two types of models, only a few parameters may need be included in the model to achieve the accurate forecasts. Simple models with forecasting effectiveness represent successful adherence to the principle of parsimony, a fundamental contribution of the Box-Jenkins approach.

(4) **Notation.** To standardize model identification, all models are specified as autoregressive integrated moving averages (ARIMA) of order p, d, q, where p refers to the order of autoregressive parameters, d refers to the number of differencing transformations, and q refers to the order of moving average parameters. Therefore, all models will be referred to as ARIMA (p,d,q) models.

3-2. APPLICATION OF BOX-JENKINS METHODOLOGY TO THE PRESENT STUDY

a. The process of model development followed in this study is within the framework of traditional Box-Jenkins methodology. That is, each forecast is based on a process of looping through the stages of identification, estimation, and diagnosis on time series first transformed to stationarity.

b. All analyses reported are based entirely on Biomedical Computer Programs, P Series (BMDP) (Dixon et al., 1981) subroutines. An effort has been made to make the traditional Box-Jenkins procedures as efficient as possible by concatenating variations in these BMDP subroutines into general programs which can be routinely executed to yield comprehensive results for each of the traditional stages of analysis.

c. The purpose of the paragraph to follow (3-3) is to illustrate the stages of Box-Jenkins analysis as applied to this investigation. Application of Box-Jenkins models found especially suitable in characterizing 7 years of monthly cargo lift data are incorporated into the special sequence of analyses developed for this study. A detailed description of the software for these analyses constitutes Appendix I.

d. Description of Box-Jenkins methodology is superficial, intended primarily to illustrate application of an efficient sequence of analyses. Reference to the main Box-Jenkins (1976) source, to the original Transportation Workload Forecasting Study (TWFS) (CAA-SR-84-2), or to secondary sources (such as Wheelwright and Makridakis, 1977) is essential for fundamental understanding of Box-Jenkins methodology.

e. Material presented in paragraph 3-3 assumes knowledge of fundamental statistical concepts such as correlation and linear regression, estimation of parameters and confidence bounds, and hypothesis testing.

f. A single time series consisting of 84 observations, monthly shipments in measurement tons (MTON) from October 1977 through September 1985, is used to illustrate application of the various stages involved in building a Box-Jenkins model. The route represented is from the California Coast to Hawaii; the commodity is chill; and the mode is breakbulk. According to final diagnostic criteria, the final model developed to characterize this series did appear to represent a successful application of Box-Jenkins methodology. The forecasts are interpreted as values from October 1985 through September 1986. Observed values for the final fiscal year of this series are plotted in Figure 3-2. Also plotted are forecasted values for this final year based on the most appropriate Box-Jenkins model identified on the basis of diagnostic procedures developed in the following paragraphs.

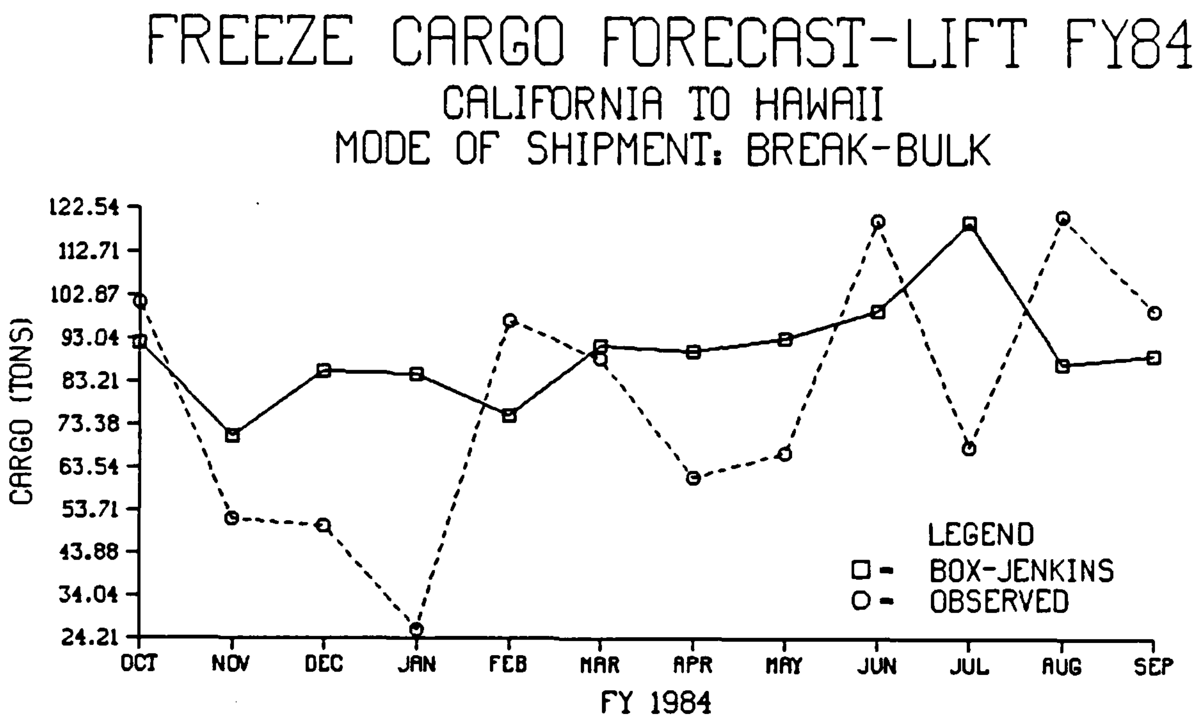


Figure 3-2. Observed and Forecasted Values Based on a Box-Jenkins Model for the Final 12 Months of a 7-Year Series

3-3. THE STAGES OF ANALYSIS

a. Stage 1 - Preliminary Data Screening

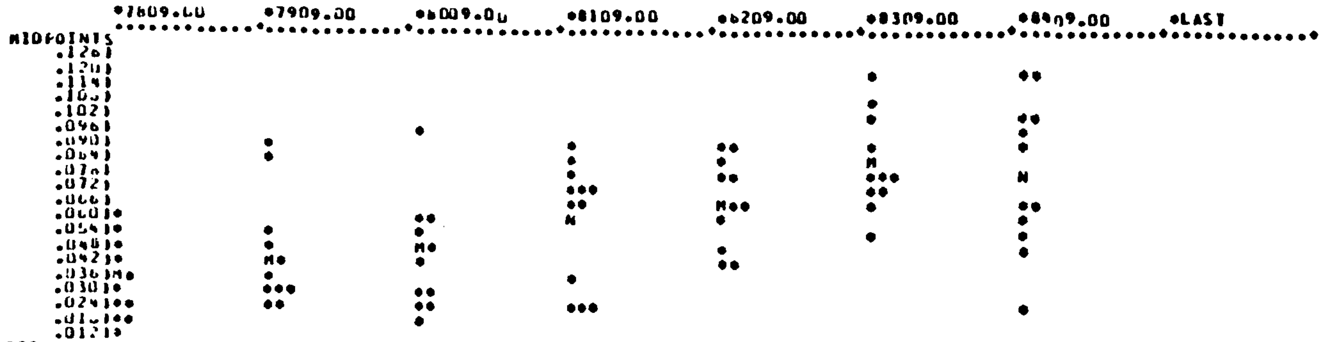
(1) Different types of graphical display serve to accentuate the presence of outliers or to indicate trend or of seasonality, effects which must be incorporated into any model. The appearance of the forecasts, when viewed against plots of the initial observations, can be one source of verification of appropriateness of a given model.

(2) For every series analyzed, routine graphical display was produced on the original observations, on 3-, 6-, and 12-month moving averages of the original observations, and on observations grouped by fiscal year (program N7BJII.EXPDFP).

(3) In Figure 3-3, a histogram in which monthly observations are grouped by fiscal year is shown. As with most series encountered in this study, significant differences exist both between means and between variances estimated from the initial observations, evidence for departure of the series from stationarity. Variance estimates which have extremely high values relative to other variance estimates can also indicate the presence of outliers; such outliers will appear as "lonely, distant stars" on a histogram.

TRANS = TONNAGE/1,000

HISTOGRAM OF TRANS (VARIABLE 91). CASES DIVIDED INTO GROUPS BASED ON VALUES OF DATE (VARIABLE 6)



GROUP MEANS ARE DENOTED BY M'S IF THEY COINCIDE WITH *'S, N'S OTHERWISE

MEAN	.033	.045	.045	.059	.068	.084	.079	.000
STD.DEV.	.014	.021	.021	.024	.016	.019	.030	.000
MAXIMUM	.057	.084	.096	.090	.091	.121	.121	.000
MINIMUM	.015	.022	.019	.023	.043	.056	.026	.000
SAMPLE SIZE	12	12	12	12	12	12	12	0

ALL GROUPS COMBINED
(EXCEPT CASES WITH UNUSED VALUES FOR DATE 1)

MEAN	.059
STD.DEV.	.027
MAXIMUM	.121
MINIMUM	.015
SAMPLE SIZE	84

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	TAIL PROBABI
BETWEEN GROUPS	.0260	6	.0043	9.52	.0000
WITHIN GROUPS	.0350	77	.0005		
TOTAL	.0609	83			

Figure 3-3. Histogram and Analysis of Variance on 84 Monthly Observations in Thousands of Measurement Tons for Commodity Chill, Breakbulk Mode from California Coast to Hawaii

(4) In the present investigation, the only treatment of values interpreted as outliers were changes recommended by the study sponsor utilizing his experience and prior knowledge of the data. All such changes are recorded in Appendix H, where Box-Jenkins modeling results are presented for individual series.

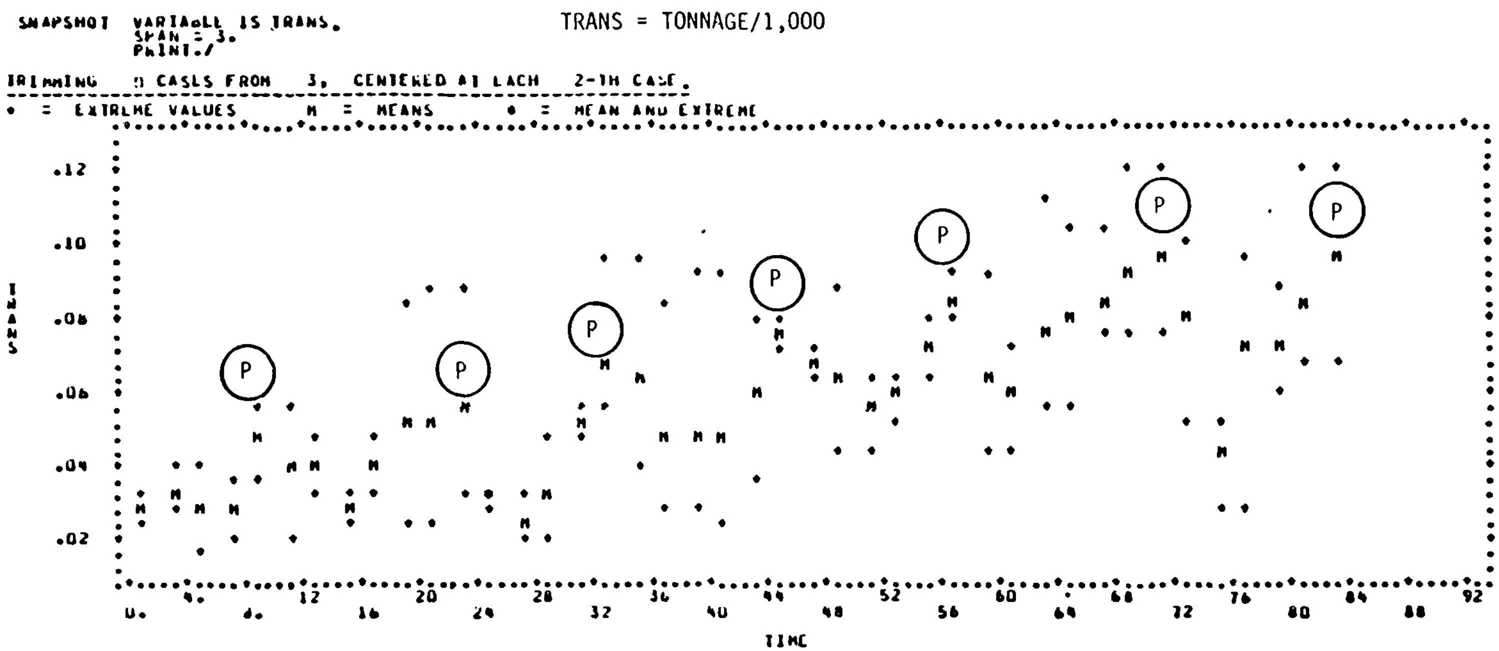
(5) In Figure 3-4, 3-month moving averages of the original observations are displayed. Existence of peaks during the summer months ("P," observations numbered near 10, or 10+ multiples of 12) is an indication that seasonality should be incorporated into the model. A gradual upward rise in the series denotes necessity to model trend.

b. Stage 2 - Identification. The process of identification consists of two parts: achieving stationarity (transforming the original series to a form which is invariate over time) and hypothesizing the number of parameters in an ARIMA model. Within each of these parts, two functions are intricately linked to the process of identification: (1) the autocorrelation function (ACF) and (2) the partial autocorrelation function (PACF).

(1) The ACF. A correlation coefficient computed over all pairs of observations separated by j "lags," i.e., j intervals of time, is called a j-th order autocorrelation coefficient. The first k coefficients, where k conventionally goes as high as 36 lags, constitute the autocorrelation function. These coefficients, with associated statistical confidence limits, are usually plotted as a function of the number of lags as a part of any computer statistical package implementing Box-Jenkins methodology. Consequently, it is possible to evaluate relative sizes of the coefficients, which provide fundamental information relevant to the Box-Jenkins modeling process. The first illustration of such a plot (BMDP output) occurs in Figure 3-5. Estimates of the standard errors of the autocorrelations, appearing at point 2 (circled) are computed as:

$$\left\{\sum_{l=0}^{K-1} r_l^2\right\}^{\frac{1}{2}} \Big/ \sqrt{n}$$

These estimates are used to bound the graphical representation of the sample autocorrelations at point 3 (circled) such that any autocorrelation greater than about 1.96 times the estimate can be easily identified as significantly greater than zero.



P DENOTES ANNUAL PEAKS,
EVIDENCE FOR 12-MONTH SEASONALITY

Figure 3-4. Three Months' Moving Averages on 84 Monthly Observations in Thousands of Measurement Tons for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

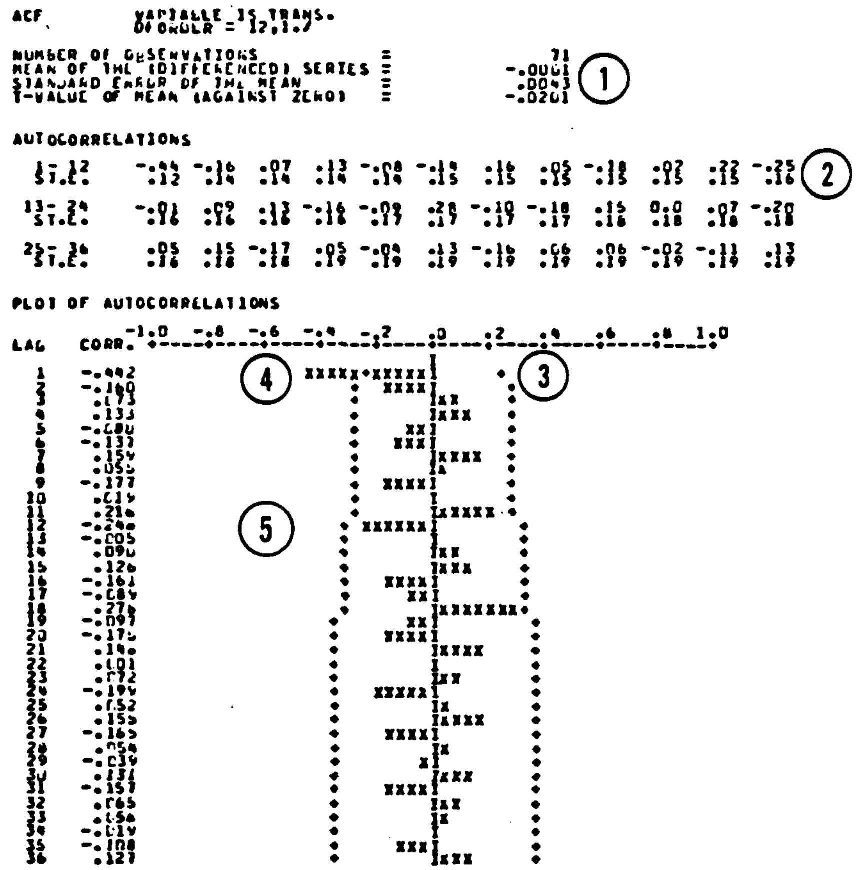


Figure 3-5. Autocorrelation Analysis of 84 Monthly Observations in Thousands of Measurement Tons for Commodity Chill, Breakbulk Mode from California Coast to Hawaii

(2) **The PACF.** A partial correlation coefficient computed between all pairs of observations k lags apart, where the influence attributable to all observations separating the pairs is partialed out, is a partial autocorrelation coefficient. The set of the first k of these coefficients, again plotted as a function of k and with associated statistical confidence bounds, constitutes the partial autocorrelation function. A PACF, again BMDP output, is illustrated in Figure 3-6. The estimate of the standard error of any partial autocorrelation function is $1/\sqrt{n}$, displayed at and graphed at 1.96 times its value at 3 (circled).

```
PACF          VARIABLE IS TRANS.
              DFORDER = 12,1./

NUMBER OF OBSERVATIONS              =          71
MEAN OF THE (DIFFERENCED) SERIES    =      -.0001    1
STANDARD ERROR OF THE MEAN          =       .0043
T-VALUE OF MEAN (AGAINST ZERO)      =      -.0201

PARTIAL AUTOCORRELATIONS

  1- 12     -.44 -.44 -.35 -.12 -.07 -.22 -.11  .02 -.11 -.14  .11 -.15   2
 ST.E.       .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 24     -.20 -.21 -.06 -.06 -.19  .02  .05 -.07  .02 -.13  .15  0.0
 ST.E.       .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 25- 36     -.18 -.07 -.08  .04 -.23  .04 -.05 -.04  .01  0.0  .09  .06
 ST.E.       .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

PLOT OF PARTIAL AUTOCORRELATIONS
```

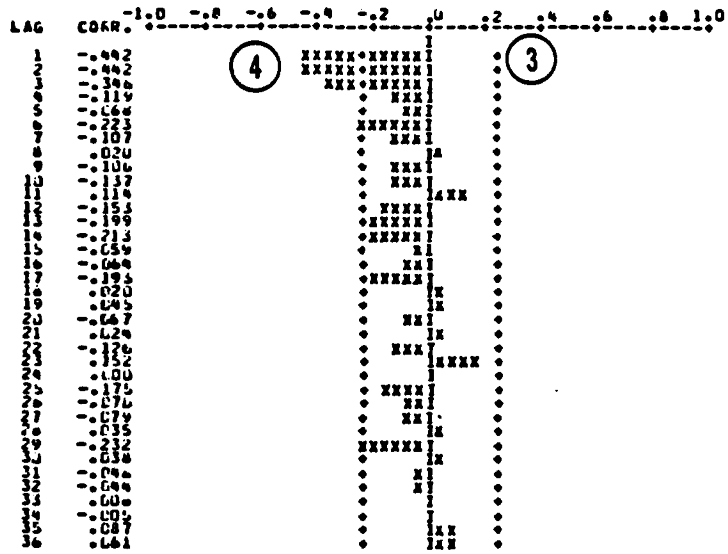


Figure 3-6. Partial Autocorrelation Analysis of 84 Monthly Observations in Thousands of Measurement Tons for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

(3) **Achieving Stationarity.** The Box-Jenkins modeling process must begin with a stationary series. A stationary series has the same mean and the same variance regardless of which intervals of time are used to estimate these parameters, and an autocorrelation function which dies out rapidly after the first few lags (i.e., the autocorrelation coefficients soon become not statistically different from zero).

- Within the Box-Jenkins framework the most common method used to achieve stationarity of a series is to "difference" the original observations. A "differenced series of order k" is a time series of differences between each observation and the observation which precedes it by k intervals in time.

- Figure 3-5 presented an example of an ACF based on a series in which differences have first been formed between consecutive observations and then between observations 12 months apart ("diff" = 1,12). Note in Figure 3-5 at point 1 (circled) that the mean of the differenced series is not statistically different from zero at the 95 percent level (using a t test based on a null hypothesis of zero) and that the sizes of the autocorrelation coefficients are well within the graphically displayed 95 percent confidence limits, point 3 (circled). An exception is the peak at lag 1 (point 4 (circled)) indicative of a systematic effect which should be incorporated into a model.

- The most common combinations of differences used on data series encountered in the present study were diff = 1, diff = 12, and diff = 1 and 12.

(4) Hypothesizing Parameters. The ACF and PACF are dual functions; examining their joint behavior for an appropriately differenced series provides the main source of information for choosing an appropriate beginning configuration of autoregressive and moving average parameters.

- In brief, a stationary model which effectively characterizes a given time series on the basis only of p autoregressive components will have a PACF which **cuts off** after lag p and an ACF with gradually diminishing coefficients--they **tail off.** Conversely, an effective model consisting only of q moving average components will have an ACF which cuts off after lag q and a PACF which tails off. If both autocorrelations and partial autocorrelations tail off, a mixed model of both autoregressive and moving average components is suggested.

- More extensive detail on this process of inferring appropriate models on the basis of the general appearance of the autocorrelation and the partial autocorrelation functions is given in the main Box-Jenkins (1976) source.

- In the illustration (Figure 3-5), the peak at point 4 (circled) which occurs in the ACF at the first lag indicates appropriateness of a first order moving average term in an ARIMA model. The peak at the 12th lag, point 5 (circled), is indicative of 12-month seasonality, also to be modeled as a moving average component. The PACF (Figure 3-6) contains sharp peaks in the first three lags (point 4 (circled)); thus as many as three autoregressive components should be evaluated in the process of building a model.

(5) Summary - the ACF and PACF. The behavior of the ACF and the PACF provides an indication of general subclasses of models which could qualify as adequate characterizations of a given time series. Particularly when a mixed model (both autoregressive and moving average components) is required, identification of the correct model may be difficult, if not impossible. The structure of the ACF and PACF can still suggest, however, an appropriate sequence of model building, beginning with low orders of parameters and increasing complexity until "overfit" (deterioration in diagnostic statistics) occurs.

c. Stage 3 - Estimation

(1) Based on hypotheses formed during the identification stage, the form of a given model (i.e., the order of differencing and the order of autoregressive and moving average parameters) is specified as statements in a BMDP subroutine ("ARIMA"). BMDP output displaying parameter estimates (point 1 (circled)), standard deviations of the estimates (point 2 (circled)), t-ratios (point 3 (circled)), residual sum of squares, mean squares (point 5 (circled)), and associated degrees of freedom (point 6 (circled)), are presented in Figures 3-7 and 3-8. The clearest exposition of the computational stages on which these statistics are based appears in Part V of the original Box-Jenkins (1976) source and in Appendix A.33 of the 1981 BMDP manual (Dixon, et al., 1981).

					1	2	3
PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8334	.0773	10.78
2	TRANS	MA	2	12	.7499	.0623	12.04
3	TRANS	AR	1	1	-.2173	.1307	-1.62
4	TRANS	AR	1	2	-.2468	.1319	-1.87

RESIDUAL SUM OF SQUARES = .030569 (BACKCASTS EXCLUDED) 4
DEGREES OF FREEDOM = 65 5
RESIDUAL MEAN SQUARE = .000470 6

Figure 3-7. Identification and Diagnostic Statistics of Best Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

					1	2	3
PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8699	.0559	15.93
2	TRANS	MA	2	12	.7648	.0616	12.42
3	TRANS	AR	1	1	-.7023	.1238	-1.69
4	TRANS	AR	1	2	-.1800	.1363	-1.32
5	TRANS	AR	1	3	.3690-001	.1357	.29

RESIDUAL SUM OF SQUARES = .029549 (BACKCASTS EXCLUDED) 4
DEGREES OF FREEDOM = 63 5
RESIDUAL MEAN SQUARE = .000469 6

Figure 3-8. Identification and Diagnostic Statistics of Overfit Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

(2) Estimates of the parameters involve two stages of computations. The Gauss-Marquadt method, a nonlinear estimation procedure, is usually applied to "starting values," partially based on solutions to systems of linear equations, determined from the first stage. Standard errors of the parameter estimates are determined from a regression matrix calculated at the last iteration of the Marquadt procedure. The t-ratio, which relates to the null hypothesis that a moving average or autoregressive parameter is zero, is simply the observed value of the parameter divided by its standard error.

(3) The residuals are primary output from the nonlinear portion of the analysis. Some values of the residuals are used to initiate computations (see Program 3, Appendix 3.3 of BMDP Statistical Software) and are not included in the sum of the squares of the residuals (hence, "eliminated due to the backcasting" in the BMDP output). The degrees of freedom are the total number of observations in the series, reduced by the number of differencing operations and by the number of parameters estimated in the model (the mean, moving average, and autoregressive components, both seasonal and nonseasonal) and the number of observations associated with the backcasting. The residual mean square is the residual sum of squares divided by the degrees of freedom.

(4) The actual sequence of operations which constituted the process of estimation in this project was the execution of a program N7BJII.EXPMOD, which was a concatenation of 36 basic ARIMA models (including 12-month seasonal models). Diagnostic results based on models suggested as appropriate models from the identification stage could then be easily examined in detail. Subsequently, building on the basic models represented in .EXPMOD was performed by specifying additional parameters within a more complex series of ARIMA models constituting the program N7BJII.MODP.

d. Stage 4 - Diagnostics

(1) The ultimate criterion for evaluating appropriateness of a given model is, of course, to forecast using the model, and then wait for actual results. All other diagnostic criteria have shortcomings. At least there are alternate criteria, however, and if used in conjunction with one another, a substantial amount of technical information can be used to appraise the potential validity of the forecasts.

(2) Application of this diagnostic criterion begins with the parameter estimates, standard deviations of these estimates, t statistics (related to departure of the parameter estimates from zero), and mean squares of residuals between observed values and expected values based on the model--all part of the BMDP output associated with every conditional model. Overfitting by increasing either autoregressive or moving average parameters one by one can result in an improved model (parameter estimates statistically greater than zero, a decrease in the root mean square, or improved patterns in the residuals (as described in the next section)). If, on the other hand, deterioration occurs in the model (parameter estimates outside the band of "acceptable" solutions, i.e. estimates less than -1. or greater than +1., estimates not significantly greater than zero, substantial increase in the size of the residual mean square, or even failure to achieve a solution), then stepping back by one parameter to the previous model is warranted.

(3) In Figures 3-7 and 3-8, BMDP diagnostic statistics were presented for a multiplicative seasonal model in which the nonseasonal component is a mixed model with two autoregressive parameters and one moving average parameter based on a single order of differencing: (p,d,q,) = (2,1,1). The 12th order moving average term, based on observations differenced by 12 months, constitutes the seasonal component, referred to notationally as $(p,d,q)_{12} = (0,1,1)_{12}$. The full multiplicative seasonal model then is represented as $(2,1,1) \times (0,1,1)_{12}$. The multiplicative seasonal model of Figures 3-8 and 3-10 would be represented notationally as $(3,1,1) \times (0,1,1)_{12}$.

(4) All parameter estimates for the model of Figure 3-7 (point 1 (circled)) are significantly different from zero at the .90 level (point 3, circled), and the pattern of the autocorrelations based on the residuals at points 3 and 4 (circled) of Figure 3-9 resembles the pattern of a random process. When the number of autoregressive terms are increased from two to three, however, coefficients for the second and third autoregressive terms are no longer statistically significant at the .90 level, point 3 (circled), of Figure 3-8, and the ACF based on the residuals takes on nonrandom appearing clumps at points 3 and 4 (circled) of Figure 3-10. Consequently, the model containing two, rather than three, autoregressive components, the more "parsimonious" model, would be considered the more appropriate model upon which to base the forecasts.

(5) This process of overfitting must begin, of course, with information pertaining to suitability of certain subclasses of models amassed during the previous stages of analyses. The process of overfitting may thus be considered a good source of confirmation of suitability of a given model and an excellent source for rejection.

(6) If all systematic sources of variation have been correctly incorporated into any model, then the residuals, the differences between observed values and values predicted under the model, should behave as random processes, with means of zero and variance which is independent of time. Dependencies existing among observations in the time series should be reflected in the model. Consequently, the autocorrelations estimated from the residuals should be essentially zero.

(7) The plot of the ACF illustrated in Figure 3-9 resembles the pattern of a random process. When the number of autoregressive terms is increased from two to three, the model of Figure 3-10, nonrandom appearing clumps can be observed at point 3 (circled) and point 4 (circled). Lags associated with "recognizable patterns," peaks occurring with regularity in the ACF based on the residuals, can also provide indications of appropriate orders of parameters to add to a model. In other words, this analysis of the residuals is a source of additional information based on the data itself.

MODEL IDENTIFICATION

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8334	.0773	10.78
2	TRANS	MA	2	12	.7499	.0623	12.04
3	TRANS	AR	1	1	-.2123	.1307	-1.62
4	TRANS	AR	1	2	-.2468	.1319	-1.87

TRANS = TONNAGE/1,000
N = 84
DIFFERENCES = 1, 12
AUTOCORRELATION FUNCTION BASED ON THE RESIDUALS.

ACF VARIABLE IS RES./

NUMBER OF OBSERVATIONS	=	84
MEAN OF THE (DIFFERENCED) SERIES	=	.0022
STANDARD ERROR OF THE MEAN	=	.3022
T-VALUE OF MEAN (AGAINST ZERO)	=	1.0346

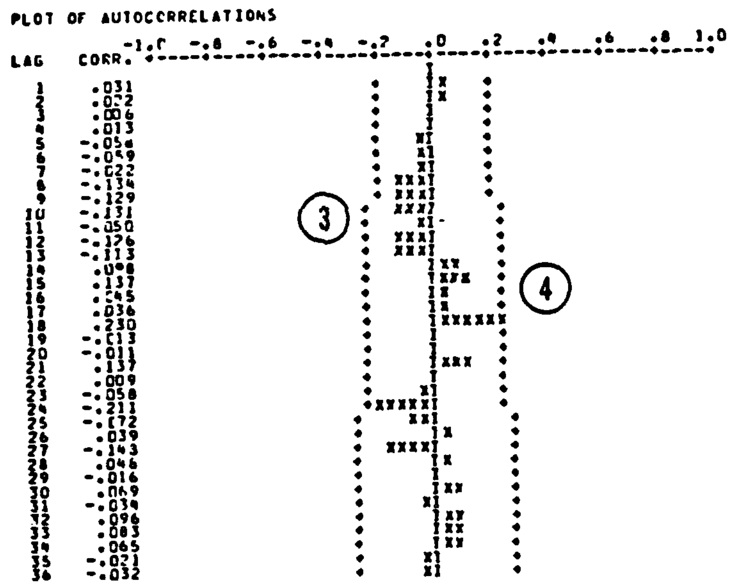
1

AUTOCORRELATIONS

1- 12	.03	.02	.01	.01	-.06	-.06	-.02	-.13	-.13	-.13	-.05	-.13
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.12	.12
13- 24	-.11	.10	.14	.05	.04	.23	-.01	-.01	.14	.01	-.06	-.21
ST.E.	.12	.12	.12	.12	.12	.12	.13	.13	.13	.13	.13	.13
25- 36	-.07	.04	-.15	.05	-.02	.07	-.03	.10	.06	.06	-.02	-.03
ST.E.	.13	.13	.13	.14	.14	.14	.14	.14	.14	.14	.14	.14

2

PLOT OF AUTOCORRELATIONS



N= 84. SS= .3045

Figure 3-9. Autocorrelation Analysis Based on the Residuals of Best Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

MODEL IDENTIFICATION

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8699	.0559	15.93
2	TRANS	MA	2	12	.7648	.0616	12.42
3	TRANS	AR	1	1	-.7023	.1238	-1.63
4	TRANS	AR	1	2	-.1800	.1363	-1.32
5	TRANS	AR	1	3	.3890-001	.1357	.29

TRANS = TONNAGE/1,000

N = 84

DIFFERENCES = 1, 12

AUTOCORRELATION FUNCTION BASED ON THE RESIDUALS.

ACF VARIABLE IS RES./

NUMBER OF OBSERVATIONS	=	84
MEAN OF THE (DIFFERENCED) SERIES	=	-.0023
STANDARD ERROR OF THE MEAN	=	.0021
T-VALUE OF MEAN (AGAINST ZERO)	=	-1.0933

1

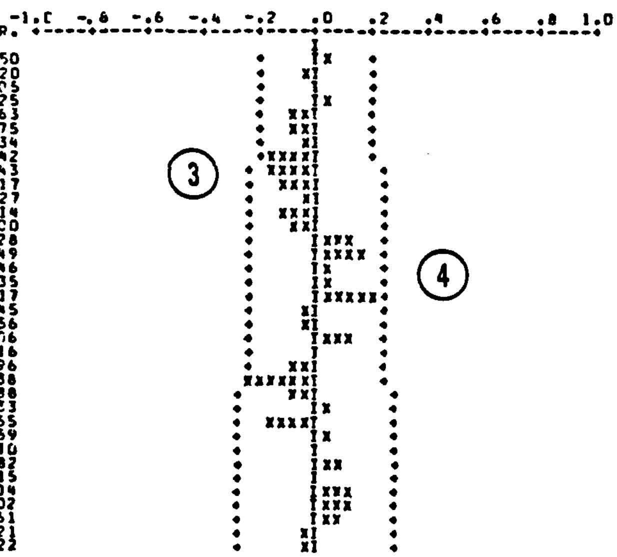
AUTOCORRELATIONS

1- 12	.05	-.02	0.0	.03	-.06	-.07	-.03	-.14	-.14	-.12	-.03	-.11
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.12	.12
13- 24	-.10	.13	.15	.05	.04	.22	-.04	-.06	.11	-.02	-.10	-.24
ST.E.	.12	.12	.12	.12	.12	.12	.13	.13	.13	.13	.13	.13
25- 36	-.09	.03	-.15	.06	.01	.08	-.01	.10	.10	.06	-.02	-.02
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14

2

PLOT OF AUTOCORRELATIONS

LAG	CORR.
1	.050
2	-.020
3	-.005
4	.025
5	-.063
6	-.075
7	-.034
8	-.142
9	-.143
10	-.117
11	-.027
12	-.114
13	-.100
14	.128
15	.149
16	.046
17	.035
18	.217
19	-.045
20	-.056
21	.106
22	-.016
23	-.096
24	-.238
25	-.088
26	.033
27	-.155
28	.059
29	.010
30	.082
31	-.015
32	.104
33	.102
34	.061
35	-.021
36	-.022



N= 84.

SS= .3331

Figure 3-10. Autocorrelation Analysis Based on the Residuals of Overfit Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

(8) Statistical tests can supplement this analysis of residuals. In analyses reported in this study, the Box-Pierce "Q" statistic provided an overall test of adequacy of the model using the first K = 36 lags.

$$Q = (N - d) \sum_{k=1}^{K} \hat{\rho}_k^2$$

is approximately distributed as χ^2 with (K - p - q) degrees of freedom, where $\hat{\rho}_k$ is an estimate of the autocorrelation for lag k, (N - d) is the number of observations in the series after differencing, and p and q are orders of the ARIMA model.

(9) The sums of the squares of the first 36 autocorrelations provided a rough index for quickly identifying the best models from a set of similar models. For example, this sum of squares increased from .3045 to .3331 as an additional, but inappropriate, parameter was added.

(10) Application of the Box-Pierce test is not necessarily helpful when distinguishing between alternate models. The observed values for the Q statistic for both models (Q = 21.62 on 32 degrees of freedom for the model of Figure 3-9 and Q = 23.65 on 31 degrees of freedom for the model of Figure 3-10) would both indicate that, overall, the autocorrelations based on the first 36 lags were not significantly greater than zero. Thus, both models could be concluded to be appropriate models.

e. Stage 5 - Forecasting. The process of looping through the stages of (1) identification, (2) estimation, and (3) diagnostic checking can continue until a model is judged to adequately characterize a given data series. Forecasts are then produced directly from parameter estimates associated with this "final" model by use of the statement "forecast" within the BMDP paragraph "ARIMA".

(1) Forecasts associated with the two models displayed in Figures 3-7 through 3-10 are presented in Figures 3-11 and 3-12 at point 1 (circled). Estimates of standard errors of the forecasts are at point 2 (circled). Confidence bounds, conventional measures of accuracy of the forecasts, can be determined from these standard errors. Observed values, if applicable, are also part of the output (at point 3 (circled)).

MODEL IDENTIFICATION

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8334	.0773	10.78
2	TRANS	MA	2	12	.7499	.0623	12.04
3	TRANS	AR	1	1	-.2123	.1307	-1.62
4	TRANS	AR	1	2	-.2468	.1319	-1.87

TRANS = TONNAGE/1,000

N = 84

DIFFERENCES = 1, 12

FORECAST ON VARIABLE TRANS FROM TIME PERIOD 84

PERIOD	FORECASTS (1)	ST. ERR. (2)	ACTUAL (3)
84	.08178	.02333	.09916
85	.08396	.02336	.00000
86	.08899	.02341	.00000
87	.07619	.02384	.00000
88	.06066	.02407	.00000
89	.08012	.02416	.00000
90	.09079	.02430	.00000
91	.08250	.02447	.00000
92	.08615	.02461	.00000
93	.10399	.02475	.00000
94	.10627	.02489	.00000
95	.09510	.02509	.00000
96	.06682	.02644	.00000

SUM OF 12 FORECASTS = 1.03

Figure 3-11. Forecasts and Standard Errors of the Forecasts of Best Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

MODEL IDENTIFICATION

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8899	.0559	15.93
2	TRANS	MA	2	12	.7648	.0616	12.42
3	TRANS	AR	1	1	-.2023	.1238	-1.63
4	TRANS	AR	1	2	-.1800	.1363	-1.32
5	TRANS	AR	1	3	.3890-001	.1357	.29

TRANS = TONNAGE/1,000
N = 84
DIFFERENCE = 1, 12

FORECAST ON VARIABLE TRANS FROM TIME PERIOD 84

PERIOD	FORECASTS (1)	ST. ERR. (2)	ACTUAL (3)
84	.07952	.02526	.09916
85	.08405	.02536	.00000
86	.07074	.02540	.00000
87	.07589	.02578	.00000
88	.06618	.02566	.00000
89	.07708	.02591	.00000
90	.08785	.02601	.00000
91	.07962	.02609	.00000
92	.08365	.02617	.00000
93	.10107	.02625	.00000
94	.10397	.02633	.00000
95	.09150	.02647	.00000
96	.08376	.02760	.00000

SUM OF 12 FORECASTS = 1.00

Figure 3-12. Forecasts and Standard Errors of the Forecasts of Overfit Box-Jenkins Model for Commodity Chill, Breakbulk Mode, from California Coast to Hawaii

(2) The standard errors of the forecasts are proportional to the product of the standard error of the residual and the cumulative sum of "psi" weights; parameters of an ARIMA model are expressed in the form of generalized autoregressive and moving average operators (see Appendix 4.3, Box and Jenkins, 1967). Consequently, the confidence interval width increases rapidly as the forecast jumps forward in time, corresponding to the incorporation of an additional positive weight into the standard error estimate with each successive interval in time.

(3) Once a final model has been chosen, the full set of parameter estimates and diagnostic results associated with this model are saved as one element on the file N7MTMK. by running the program BJII.FORP.

f. Stage 6 - Comparisons of Forecasts with Observed Values

(1) An additional kind of diagnostic procedure should be built into development of an appropriate Box-Jenkins model before production of forecasts. The model can first be built on a shortened version of the original series, say shortened by 12 months, and then forecasts based on this shortened series compared to the actual observations which occurred at the same time. This closeness of fit of "forecasted" values to corresponding observed values can be used to select a "best" model which is then refitted to the full series so that the final forecasts will be based on the full series.

(2) Due to time constraints, this diagnostic process was not built into selection of the best model for time series analyzed in the present study. Rather, all Box-Jenkins models were developed initially from the full set of 84 data points (7 fiscal years). The only use of observed values to evaluate forecasts was a comparison of total tonnage forecast with total tonnage observed for the preceding year. For the model illustrated in Figure 3-8, the "better" model, the forecasted tonnage sum was 1,030; observed tonnage for the previous year summed to 948, an 8.6 percent difference. For the "overfitted" model illustrated in Figure 3-10, forecasted tonnage summed to 1,000, only a 5.5 percent difference from the observed. This type of comparison of forecasted values with observations from the previous year was used only when diagnostic results from stage 4 were insufficient to distinguish a uniquely effective model.

(3) The comparison of forecasted values with comparable observed values was used, however, in the "postproduction" analysis to choose between alternate forecasting methodologies: Box-Jenkins versus Winters. That is, the best Box-Jenkins model chosen on the basis of the full data series (7 years of monthly observations) was refit to only the first 6 years and then forecasts developed for the 7th year. Forecasted values could then be compared with observed values for the 7th year and used to choose between alternate models. Results based on this method of comparison are the subject of the next chapter.

CHAPTER 4

POSTPRODUCTION ANALYSIS

4-1. INTRODUCTION. Using historical time series analysis, a system has been developed by CAA suitable for adaptation by MTMC for improving forecasting capability of surface cargos. Forming the CAA system are two forecasting methodologies, Box-Jenkins (1976) time series analysis and Winters (1960) linear and seasonal exponential smoothing, and multiple criteria for choosing the "best" forecasts. It is the subject of this chapter to present information evaluating effectiveness of the system.

a. Box-Jenkins (B-J) methodology, known for forecasting accuracy, has become a standard for evaluation of other forecasting approaches. Thus its inclusion into development of any new forecasting system is highly appropriate. It is also extremely costly with respect to time and experience required to produce the forecasts. Because of the large number of time series which describe over-ocean cargo transportation, a cost-efficient as well as accurate methodology is essential.

b. The Winters (W) method, an exponential smoothing model which incorporates components for randomness, linearity, and seasonality, has properties of both accuracy and efficiency, as was demonstrated in the original TWF Study. Consequently, forecasts based on the Winters methodology were obtained for over 400 route-commodity-mode combinations on which data was available. The Box-Jenkins methodology was applied only to the "most important" (74) of these series.

c. The initial decision rule applied to time series with two sets of forecasts was to choose the forecast associated with the smallest root mean square (RMS):

$$RMS = \sqrt{\frac{\sum_{i=1}^{N} (O_i - E_i)^2}{N}},$$

where O_i is the i-th observed value in a series of N observations and E_i is the corresponding expected value for a given model. This RMS statistic is a measure of "fit." Due to a tight time schedule, this "fit" provided the only feasible decision rule in the initial choice of the better of two sets of forecasts produced by two methods. This choice determined initial forecast estimates delivered to MTMC.

d. In the field of time series analysis, a more traditional approach to evaluating alternate forecasts is to first build a model on a subset of the total series and then to "forecast" the remaining observations. Root mean square statistics derived from comparisons between such forecasts and the corresponding observed values are referred to as measures of "accuracy" of the forecasts.

e. In this chapter are described results measuring both "fit" and "accuracy" for the two different forecasting methodologies. These results, obtained from a substantial number of time series, form the basis for evaluating the CAA forecasting system.

4-2. THE RESULTS. By commodity and mode, a total of 69 time series was selected for Box-Jenkins analysis. (Series with substantial numbers of missing values or forecast values specified by the sponsor were previously excluded from this total.) Each such series consisted of up to 84 monthly observations, from October 1977 through September 1984 (FY 78-FY 84). Winters forecasts were determined on 562 time series, including all series subjected to Box-Jenkins analysis. The postproduction analysis thus began with the 69 series for which both Box-Jenkins and Winters forecasts were available.

a. In that some of the Box-Jenkins forecasts were determined from a different statistical package than BMDP, essential comparative statistics are available for only 66 out of the 69.

b. Detailed Results (Table 4-1)

(1) In Table 4-1 are presented detailed evaluative statistics on the two forecasting methods for the 66 time series subjected to both Box-Jenkins and Winters analysis. The order of presentation of the columns reflects the sequence of analyses in producing the FY 86 forecasts for MTMC. This sequence is not necessarily the recommended sequence in building a "best" forecast, but was rather the only feasible sequence due to limited time available to produce a large number of forecasts. The percentage of FY 84 total tonnage (3,990,524 tons) represented by the last fiscal year of every time series is presented in column 1 of Table 4-1.

(2) The RMS statistic, the criterion of "fit" used to select the initial forecasts of FY 86, is presented in columns 3 and 4 of Table 4-1 for Box-Jenkins and Winters, respectively. (RMS statistics are not available for the three series in which the Box-Jenkins model was fitted to the natural log transformation, footnote b, Table 4-1.) In column 5, the method chosen is represented as "BJ" or "W" depending on which of columns 3 or 4 is smaller.

Table 4-1. Comparative Statistics Between Box-Jenkins and Winters Forecasts

Route/ Commodity/ Mode	Percent of FY 84 total tonnage	Box-Jenkins fit statistic	Winters fit statistic	Method with better fit	Box-Jenkins accuracy statistic	Winters accuracy statistic	Method with better accuracy	Percent error: Box-Jenkins	Percent error: Winters
0117 Chill cont	.105	138.87	278.31	BJ[a]	153.17	184.58	BJ	-10.95	-24.03
Freeze cont	.470	350.50	384.85	BJ	414.07	319.75	W[a]	-5.51	-4.11
POV cont	2.645	3,677.63	2,768.81	W	8,489.01	3,924.17	W	+84.42	+.25
Ammo cont	.038	b		BJ	65.52	73.57	BJ	+3.69	+10.70
General cont	25.788	4,442.44	16,799.34	BJ	10,278.39	11,633.55	BJ	-9.75	-12.26
HHG cont	.190	704.03	187.65	W	210.31	197.57	W	-14.32	-20.16
CONEX cont	.153	175.45	217.95	BJ	193.40	190.73	W	-18.98	-10.05
Special cont	.094	163.20	1,280.57	BJ	181.87	2,448.85	BJ	-44.99	+61.75
POV brkblk	1.454	b		--	4,438.27	4,333.93	W	-2.74	+25.30
Ammo brkblk	.452	3,320.28	2,775.57	W	2,592.82	2,750.47	BJ	+153.37	-99.38
General brkblk	.566	1,024.27	935.21	W	1,098.75	1,111.66	BJ	+18.09	+21.28
CONEX brkblk	.053	524.60	711.73	BJ	410.03	1,005.32	BJ	+32.16	-81.27
Special brkblk	6.260	4,331.44	9,790.33	BJ	13,592.63	20,105.42	BJ	+9.30	-73.29
Ammo MILVAN	1.488	1,448.20	1,662.38	BJ	3,186.80	3,338.70	BJ	-52.93	-59.27
General MILVAN	.082	209.96	315.37	BJ	334.53	573.15	BJ	-74.09	-89.57
0217 General cont	1.032	1,013.80	969.24	W	1,030.24	756.08	W	+20.77	-9.72
HHG cont	.096	178.59	157.30	W	190.60	273.83	BJ	+18.46	-63.45
General brkblk	.170	771.05	720.72	W	1,168.12	640.89	W	+137.36	+58.10
Special brkblk	2.320	--	8,125.84	--	9,614.01	13,102.09	BJ	-2.31	-93.64
1701 POV cont	.741	1,040.45	1,120.05	BJ	1,694.19	1,679.15	W	+43.64	+28.35
HHG cont	.147	237.42	360.32	BJ	356.06	806.84	BJ	+.97	-100.00
General brkblk	.097	256.71	264.49	BJ	231.96	253.14	BJ	-28.87	-12.21
HHG brkblk	.554	860.67	758.26	W	879.11	1,320.35	BJ	-8.81	+6.51
CONEX brkblk	1.600	311.86	3,638.54	BJ	c	6,624.13	--	--	-60.65
Special brkblk	.308	2,220.49	4,304.69	BJ	4,292.60	2,899.26	W	-110.06	+25.35
General MILVAN	.426	708.93	796.91	BJ	1,507.15	1,382.14	W	-75.88	-66.76
0351 Chill cont	.084	136.63	115.99	W	58.44	81.60	BJ	+1.4	-14.78
Freeze cont	.090	136.37	186.75	BJ	101.60	108.78	BJ	+3.96	-4.62
POV cont	.112	126.98	252.23	BJ	135.96	413.77	BJ	-27.24	-43.85
Ammo cont	.002	28.81	20.58	W	16.85	22.98	BJ	-149.27	95.56
General cont	4.299	2,613.57	5,174.16	BJ	3,431.35	2,756.34	W	-12.78	-11.14
HHG cont	.034	145.13	145.49	BJ	547.21	173.72	W	141.22	116.01
CONEX cont	.006	30.44	46.00	BJ	44.19	42.16	W	51.71	41.32
Special cont	.052	180.21	178.90	W	522.95	461.28	W	-258.83	-100.00
Ammo brkblk	.142	3,640.19	5,711.36	BJ	2,815.58	4,057.56	BJ	+559.12	+616.95
General brkblk	.117	440.48	652.15	BJ	485.18	391.40	W	+72.99	+19.92
0327 Freeze cont	.006	17.19	16.09	W	17.60	28.82	BJ	-25.77	-41.04
POV cont	.002	8.91	7.16	W	c	7.26	--	--	-46.59
Ammo cont	.001	21.57	19.53	W	29.01	38.06	BJ	-690.59	-100.00
General cont	1.983	877.31	853.68	W	1,043.57	856.56	W	-8.27	-4.64
HHG cont	.029	74.83	36.77	W	39.85	53.63	BJ	-12.70	-30.64
CONEX cont	.001	1.82	5.08	BJ	2.73	9.17	BJ	-23.30	-100.00
Special cont	.002	14.52	17.53	BJ	10.12	43.34	BJ	+5.73	-100.00
Chill brkblk	.006	12.08	10.34	W	114.01	12.21	W	+41.57	+19.27
Freeze brkblk	.024	20.83	34.21	BJ	30.84	49.11	BJ	+13.42	+19.14
POV brkblk	.669	470.99	339.81	W	840.98	589.38	W	-27.70	-12.92
General brkblk	.026	85.01	69.12	W	114.27	102.37	W	-74.33	-57.51
0425 Chill cont	.018	37.86	47.32	BJ	70.55	115.86	BJ	-92.60	-100.00
Freeze cont	.008	14.40	1.97	BJ	29.63	31.22	BJ	+3.49	-57.51
POV cont	.245	336.08	661.28	BJ	602.62	533.40	W	+57.33	-7.41
Ammo cont	.002	2.33	1.64	W	1.17	2.91	BJ	+150.07	-67.41
General cont	1.490	979.64	1,721.96	BJ	1,066.85	976.70	W	+10.86	+7.49
HHG cont	.054	92.18	126.02	BJ	244.32	115.56	W	+132.91	+53.17
1118 POV cont	.020	34.01	36.26	BJ	55.09	68.03	BJ	-1.76	-37.57
0350 Chill cont	.030	42.82	33.17	W	37.79	44.94	BJ	-11.22	-26.70
Freeze cont	.055	57.85	53.88	W	86.09	78.18	W	-5.95	-3.32
POV cont	.002	10.27	13.99	BJ	28.41	36.66	BJ	+486.83	-96.92
General cont	1.474	957.40	963.17	BJ	1,694.16	1,063.34	W	-31.78	-9.20
HHG cont	.008	34.76	75.61	BJ	15.21	83.29	BJ	-23.29	-86.16
General brkblk	.020	60.76	62.25	BJ	c	131.99	--	--	-98.64
Special brkblk	.008	45.98	53.27	BJ	c	137.51	--	--	-100.00
2727 POV brkblk	.016	30.26	30.91	BJ	38.84	36.20	W	-29.07	-10.68
Ammo brkblk	.015	35.04	31.88	W	60.10	72.03	BJ	-38.19	-79.17
General brkblk	.154	165.93	151.33	W	210.59	169.67	W	-16.75	-12.91
HHG brkblk	.002	9.11	6.58	W	6.26	3.95	W	+37.82	-33.47
Special brkblk	.412	3,141.70	6,176.83	BJ	c	3,698.51	--	--	+158.94

[a]BJ = Box-Jenkins, W = Winters.

[b]Comparable statistics not available (BJ model based on natural log transformation).

[c]BJ model failed when applied to shortened series.

(3) Results of columns 6 and 7 display the measure of "accuracy" generated by the process of "backcasting." That is, a model fitted to only the first 6 years (FY 78-FY 83) is used to generate the 12 monthly observations for the last year (FY 84). The accuracy statistic is the root mean square computed on differences between the FY 84 forecasts and the actual values occurring in FY 84.

(4) Backcasting for the Box-Jenkins method was performed by estimating new parameters for the shortened series, using the best model identified on the basis of the total series. That is, only the "form" of the model (the order of differencing and structure of autoregressive and moving average components) remained the same between the full series model and the shortened model. Backcasting for the Winters method was performed by fitting a totally new model to 5 years of the series (FY 79-FY 83) and then generating FY 84 forecasts. (Note that for five series reported in Table 4-1, footnote c, when a Box-Jenkins model appropriate for all observations was fitted to a subset of the observations, the model failed; i.e., coefficients for parameter estimates fell outside the feasible range of -1.0 to +1.0.)

(5) The "BJ" or "W" notation of column 7 indicates which forecasting methodology is "more accurate," i.e., which of the two RMS statistics of columns 5 or 6 is smaller.

(6) The final columns in Table 4-1 are determined from the sum of the total tonnage during the final year and the sum of the forecasted values. These sums, expressed as a "percent error," are based on the difference between observed and forecasted sums divided by the observed sum:

$$\frac{\text{forecasted sum - observed sum}}{\text{observed sum}} \times 100$$

(Note that the value "-100.00" for the Winters error statistic is used to indicate that the total tonnage forecasted was less than zero. Values below zero were not truncated in computing the Box-Jenkins percent error.)

c. Summary Results (Table 4-2)

(1) Summary results based on results from Table 4-1 are presented in Table 4-2. For the 63 series for which comparable "fit" statistics were available, better fit was observed for 38 (60.3 percent) Box-Jenkins models and 25 (39.7 percent) Winters models. According to the "accuracy" criterion, of the 61 series for which complete results were available, 34 (55.7 percent) of the Box-Jenkins models compared with 27 (44.3 percent) of the Winters models were the more accurate.

Table 4-2. Summary Results on Fit and Accuracy Between Box-Jenkins and Winters Forecasts

Better method based on fit	Better method based on accuracy	Number of time series	Percentage of series with full results	Total better fit	Percentage of series with full results	Total better accuracy	Percentage of series with full results
BJ	BJ	20	34.5%	BJ 38	60.3%	BJ 34	55.7%
W	W	12	20.7%	W 25	39.7%	W 27	44.3%
BJ	W	14	24.1%				
W	BJ	12	20.7%				
Series for which complete set of comparable statistics not available		8		3		5	
Total series		66		66		66	

NOTE: BJ = Box-Jenkins
W = Winters

(2) Although these results appear at first to favor the Box-Jenkins methodology, their complexity increases when examining results based on both criteria simultaneously. A full set of such comparative statistics are available for 58 routes. Referring then to both fit and accuracy, the Box-Jenkins results are consistently superior for 20 (34.5 percent) series; Winters results are consistently superior for 12 (20.7 percent) series.

(3) Inconsistency occurs between criteria for the 26 (44.8 percent) remaining routes. That is, Winters results are superior to Box-Jenkins based on fit, but not accuracy, in 14 (24.1 percent) series. Conversely, Winters results are superior to Box-Jenkins based on accuracy, but not on fit, in 12 (20.7 percent) series. Occurrence of inconsistencies in results between alternate criteria means that the initial forecasts submitted to MTMC as the "better" forecasts are not necessarily the better forecasts. Subsequently, alternate forecasts designated as "better" evaluated on the basis of the accuracy criterion were submitted to MTMC.

d. **Comparative Results (Table 4-3)**

(1) To permit comparison of forecasting efficacy of this with the original TWF Study, total forecasted tonnage and total observed tonnage (both for FY 84) were determined by combining all routes and modes in the series represented in Table 4-1 by separate commodity. The percentage error based on these totals

$$\frac{-(\sum \text{Observed} - \sum \text{Forecasted}) \times 100}{\sum \text{Observed}}$$

is presented by commodity in Table 4-3. Routes where Box-Jenkins failed in the backcasting procedure were eliminated from computations.

Table 4-3. Percentage Errors by Commodity

Commodity	Box-Jenkins FY 84	Winters FY 84	Number of time series	Percent of total tons shipped in FY 84
General brkblk	30.72	17.27	6	1.1
General container	-9.21	-10.69	6	36.0
General MILVAN	-75.59	70.43	2	.5
Special	.77	-68.57	7	9.4
POV	41.39	7.17	9	8.2
AMMO	32.42	-21.70	8	2.1
HHG	-3.37	14.21	9	1.1
CONEX	-7.10	-28.89	4	.2
Chill + freeze	-6.53	-9.56	10	.8

(2) This percentage error is the same statistic presented by commodity in Table 6-2, Chapter 6, of the TWFS. In the original study, these error measures ranged only from 0.6 to 28.6 (FY 82). By contrast, percentage errors of the present study ranged from 0.77 percent to -68.57 percent for commodities common to both studies. (The percentage error was as high as -75.59 for routes grouped as General MILVAN, but was not analyzed in the original study.)

(3) The essential difference between this study and the previous one is the degree of aggregation in the observations on which the time series are based. Aggregating over all routes and modes yielded time series with regularities which could be more effectively modeled using a historical statistical forecasting approach. Monthly observations broken down by individual route, commodity, and mode reduced this regularity and hence efficacy of the methodology. It is of interest that the categories "General MILVAN," "Special," and Ammo," where extremely high percentage errors are reported in Table 4-3, are categories identified by the sponsor for forecasting because there was "everything to gain" and "nothing to lose." That is, historical behavior of time series for these categories can be expected to have little relation to observations in the final years.

4-3. DISCUSSION OF THE RESULTS. Discussion of results is presented in three paragraphs: 4-4, Evaluation of the Methods; 4-5, Evaluation of the Criteria; and 4-6, Evaluation of the Total System.

4-4. EVALUATION OF THE METHODS. Methods of time series analysis can be evaluated on the basis of many criteria. Three criteria of general interest--accuracy, cost, and applicability--as they apply to results of the present investigation will be discussed in the following paragraphs. To clarify this discussion, quantitative indices developed by Wheelwright and Makridakis (1977) will be compared with corresponding indices judged to be appropriate to the current investigation. These indices are presented in Table 4-4. The indices for cost and applicability range from 0 to 10, with 10 indicating the highest cost and greatest difficulty in applicability. As accuracy increases, however, the size of the index also increases; a rating of 10 corresponds to best accuracy.

a. Methods Evaluated as to Accuracy. Wheelwright and Makridakis report a 10 to 2.5 high superiority ratio of Box-Jenkins to Winters with respect to accuracy. (Note that in this particular context, "fit" becomes classified as a measure of "accuracy.") Referring to results reported in Tables 4-1 and 4-2, Box-Jenkins forecasts are somewhat favored to Winters forecasts. Consistent superiority of Box-Jenkins methodology, incorporating both criteria reported in Table 4-2, however, occurs for only 34.5 percent of the time series; Winters is consistently superior in 20.7 percent. This 1.7:1 superiority is markedly less striking than the 10:2.5 ratio of Wheelwright and Makridakis. Both methods are superior in one, but not both, criteria in 44.8 percent of the series.

Table 4-4. A Comparison of Forecasting Techniques on Three Basic Criteria

Criteria	Box-Jenkins		Linear exponential smoothing (Winters)	
	Ratings based on previous investigations[a]	Ratings based on this investigation	Ratings based on previous investigations	Ratings based on this investigation
Accuracy[b]	10	3.45	2.5	2.07
Costs[b]				
Development	8	1[c]	1	1
Storage requirements	7	7	1	1
Running	10	10	1	1
Applicability[b]				
Time required to obtain forecast	7	7	1	1
Easiness to understand and interpret the results	4	4	7	7

[a]Wheelwright and Makridakis, Table 12-1, 1977.

[b]Scale from 0 to 10; 0 = smallest, 10 = highest.

[c]Applicable only if applying software developed for this study.

(1) In other words, substantial forecasting efficacy, as measured on the basis of two criteria on a large number of time series, has been demonstrated for the Winters methodology much more than would have been anticipated from previous ratings in the literature. This is a particularly important observation, in that most of the forecasts (over 400) submitted to MTMC could only be developed using the Winters method due to the extremely time-consuming nature of the Box-Jenkins procedure.

(2) It also needs to be pointed out that Wheelwright and Makridakis assign their ratings on the basis of "experience" and knowledge of the literature. In this report, however, findings are developed on the basis of analytical comparisons on a substantial set of data. Many reports affirming the Box-Jenkins methodology are based on very small samples of time series, as small as 1 and often not greater than 10.

b. Methods Evaluated as to Cost. The differential between the Box-Jenkins and Winters methods may be considered infinite, if cost is equated to time to produce forecasts. Over a 3-month period of analysis, the Winters forecasts on 562 time series (over 99 percent of the total over-ocean surface cargo lift) were produced during a few hours, as just one portion of the more general task of screening data, building uniformly formatted time series, merging results from the two methodologies, and writing final forecasts. By contrast, the 74 sets of forecasts based on Box-Jenkins methodology (developed to meet 75 percent of the FY 86 over-ocean surface cargo lift requirement) were completed during the same interval of time, but just barely. The Box-Jenkins forecasting procedure consumed full time of one analyst, plus approximately 1/10th of two others.

(1) It is informative to again refer to ratings of Wheelwright and Makridakis (W&M) and to compare their cost ratings (classified as development cost, storage requirements cost, running cost) with ratings specifically characteristic of the present investigation.

(a) Development. Wheelwright and Makridakis rate cost of development as 8 (Box-Jenkins) to 1 (Winters), i.e., high cost for the Box-Jenkins method. At the current stage of CAA software development designated for MTMC, application of either Winters or Box-Jenkins methodology by MTMC should have a rating of 1 for Box-Jenkins and 1 for Winters (assuming purchase of BMDP software by MTMC). However, considering any programing development in either of the two TWF studies within CAA, the ratings would be 5 (Box-Jenkins) and 5 (Winters).

1. Although skeleton FORTRAN coding was available for the Winters method, expertise in programing effort was required to create an efficient FORTRAN program compatible with the Sperry/UNIVAC system. This effort included identification of a subtle and devious error published in the original technical presentation of the method.

2. The Box-Jenkins rating assumes implementation of a statistical package which specializes in Box-Jenkins methodology. Successful production of as many as five Box-Jenkins forecasts per day in the present investigation required development of two additional types of software.

- First, BMDP subroutines calling for different stages of Box-Jenkins analysis were concatenated, so that the routine execution of an "exploratory" program could simultaneously produce diagnostics associated with varieties of models likely to be appropriate for the present investigation. Actually, a core of three such exploratory programs was developed and permitted efficient evaluation of every time series. An additional program was executed when specific modifications to Box-Jenkins models were necessary, building on results obtained from the exploratory analyses. All of these BMDP concatenation programs are described in more detail in Appendix I.

- A second type of program was developed to read BMDP output, saved as a temporary file, to make possible rapid comparison of alternate models. Especially useful in evaluating different models were (1) computations of sums of squares of autocorrelations based on the residuals (and the associated Box-Pierce statistics) and (2) comparisons based on differences computed between observed values and forecasted values for corresponding units of time. Neither of these diagnostics were available from the BMDP package.

(b) Storage Requirements. The W&M rating of 7 for Box-Jenkins on storage requirements reflects the large computer memory required by any statistical package. Box-Jenkins subroutines for the current CAA version of BMDP alone utilizes about 60K on the Sperry/UNIVAC 1104. In that this memory requirement became inevitably linked with slow runs during prime time, the rating of 7 is probably justified. Storage required by the Winters analysis is minimal, both receiving and deserving a rating of 1.

(c) Running. The rating of 10 (Box-Jenkins) to 1 (Winters) is justified. Running time for Winters can take no more than seconds per series. The total running time for over 400 series was 6-8 hours using the Winters software.

- Box-Jenkins analysis, at its most efficient stage in developing forecasts for the study, required, for every time series, execution of a minimum of three programs (all concatenations of BMDP subprograms) totaling a minimum of 4 minutes of computer time on the CAA Sperry/UNIVAC 1104. About half the time series required more detailed evaluation, hence one or two additional runs of 1 to 2 minutes per run.

- At the peak of efficiency in BMDP analysis (measured with respect to analyst experience and development of useful concatenations of BMDP subprograms), correct Box-Jenkins analysis could be completed on no more than five different time series per day.

c. Methods Evaluated as to Applicability. W&M dichotomize applicability into time required to obtain forecasts and easiness to understand and interpret the results.

(1) Time Required to Obtain Forecasts. The W&M rating of 7 (Box-Jenkins) and 1 (Winters) is consistent with time to forecast required during the present study, after hard copy computer output from all exploratory analyses was available. An essential distinction between the Box- Jenkins and Winters methods is that unique forecasts characteristic of Winters methodology do not occur when Box-Jenkins methodology is used. Rather, a complex series of diagnostic statistics must be evaluated to identify the "most appropriate" model from a family of models for every time series, and a minimum of 1 year graduate level statistics is required for correct evaluation. If poor diagnostics are associated with the routine execution of the exploratory programs applied to every time series, then additional analyses must be

designed, specially tailored to build more complex Box-Jenkins models utilizing the information (the diagnostics) from the exploratory analyses.

(2) Easiness to Understand and Interpret the Results. The W&M ratings of 4 (Box-Jenkins) and 7 (Winters) are suitable for the present investigation. The rating of 7 assigned to Winters methodology probably reflects the requirement for knowledge of time series analysis, particularly of methods of exponential smoothing. The rating of 4 assigned to Box-Jenkins reflects the requirement for training in both statistics and time series analysis in order to understand and interpret the results.

(3) Summary. To summarize, comparison of Box-Jenkins and Winters methodology with respect to both cost and applicability heavily favors Winters. Support of inclusion of classic Box-Jenkins methodology as part of a forecasting system must depend on evaluation pertaining to accuracy.

4-5. EVALUATION OF THE CRITERIA. A statement of reservation should be issued so that limitations inherent in any of the comparative statistics used as validation criteria for the forecasts are properly recognized. Each criterion measures a slightly different type of time series behavior and each can contribute toward evaluating appropriateness of a given model.

a. Both the fit and the accuracy criteria, based on sums of squares of differences between observed and predicted values, assume that the cost associated with overstocking a ship is the same as the cost associated with understocking a ship (i.e., all residuals are squared and then summed, not differentially weighted as to positivity or negativity).

b. The percentage error criterion, based simply on total forecasted tons and total observed tons in the final 12 months, assumes that the cost of overstocking is offset by cost of understocking (i.e., positive and negative residuals can cancel if of equal value). Furthermore, this percentage error does not reflect the effectiveness of the time series in modeling the peaks and troughs of seasonality.

c. The fit statistic computed on predicted and observed values over the entire time series makes no adjustment for degrees of freedom associated with the different models under comparison. This is another way of saying that there is no measure to reflect degree of parsimony. Yet, the ability to characterize a time series with only a few parameters is an outstanding feature characteristic of Box-Jenkins methodology, to which is attributed unusually accurate forecasts.

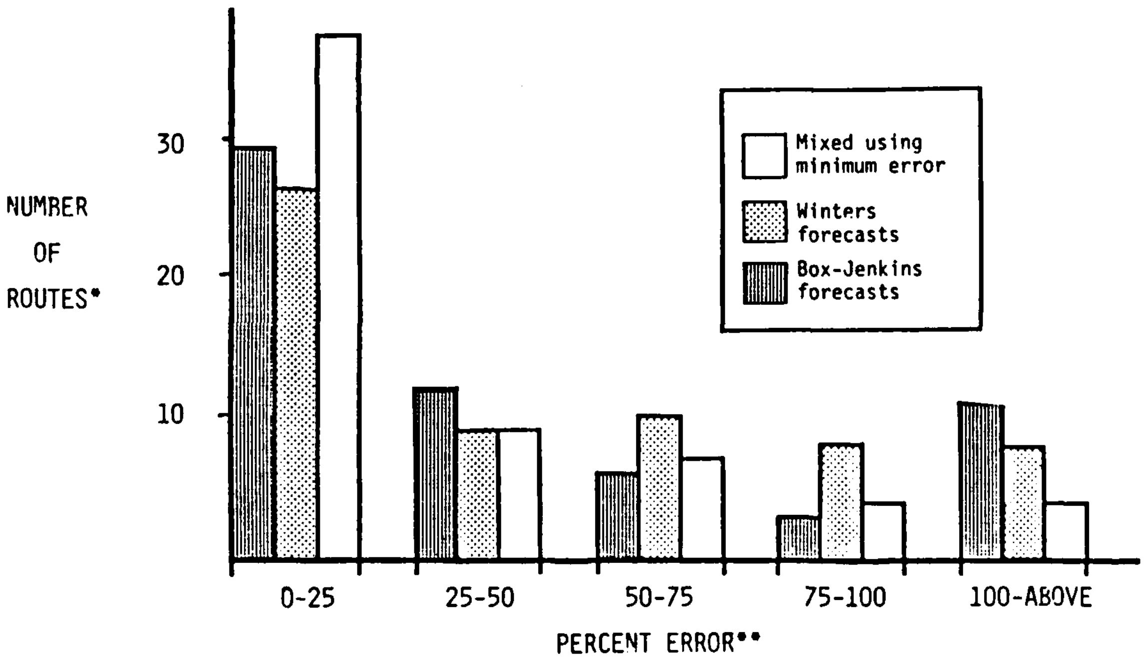
d. Finally, all of these comparative statistics are applied to time series which are not exactly the same for the different methods. Extremely high values in the first of the 7 years of observed values apparently contributed to a consistent underforecast throughout many Winters models, leading to a decision to drop the first 2 years from all data series. Consequently, Winters forecasts are based on time series of 5 years. Only the first year was dropped for the evaluative "backcasts." Box-Jenkins models, however, were developed from all 7 years; if the resulting forecasts were judged "by eye" to be out of appropriate range, then adjustments

were made to the data. These adjustments, based on recommendations by the sponsor, were recorded, but not transferred to the data base used to generate the Winters forecasts.

e. In summary, difficulties can be associated with both the comparative statistics used to evaluate the forecasts and with the data on which the comparisons are based. If it becomes necessary to choose one single evaluative criterion to determine which forecast is "better," then it must be emphasized that the "accuracy" statistic, the RMS based on backcasting results, is the criterion traditionally applied more often to evaluate efficacy of alternate forecasting methods.

4-6. EVALUATION OF THE TOTAL SYSTEM

a. The fundamental contribution of the CAA forecasting system may be considered to be the combination of two forecasting methodologies with comprehensive evaluative criteria to choose a "better" set of forecasts. If each set of forecasts is evaluated on the basis of percentage difference between total tonnage forecast during the final year and total observed tonnage (the "percentage error" criterion), then choosing the method with the smaller error substantially improves the results. This consequence of comparing results from alternate methods to increase forecast efficacy is illustrated in Figure 4-1.



* BASED UPON 61 ROUTES

$$**\text{PERCENT ERROR} = \frac{\text{OBSERVED-FORECAST}}{\text{OBSERVED}} \times 100$$

Figure 4-1. Percent Error on FY 84 Backcasts

b. In this figure, histograms are plotted to display the number of series in groups of increasing percentage error of the forecasts (both Box-Jenkins and Winters). Out of 61 series being compared, as many as 37 sets of forecasts could be categorized in the smallest error group by choosing results with the least error. Reliance on only one forecasting method would have resulted in only 29 Box-Jenkins series being characterized by less than 25 percent error--and only 26 Winters series, were Winters the only method.

c. In contrast, when referring to the number of series yielding forecasts with 100 percent or more error, reliance on only one methodology would produce 11 series in this high error category for Box-Jenkins and 8 series for Winters. Choosing results from the method with the least error, however, reduces the number of series with error of 100 percent or more to only 4 series. (In Table 4-1, the value "100.00" for the Winters error statistic is used to indicate that the total tonnage forecasted was less than zero. Values below zero, however, were not truncated in computing the Box-Jenkins error statistic.)

d. Results of Figure 4-1 illustrate another major point. The striking differences which do occur in effectiveness of forecasting results become readily apparent from observing the figure. Such variation in results is not foreseeable from initial inspection of the data series. However, once the distinctly poor forecasts are identified on the basis of the statistical process described in this report, then it may become possible for a functional analyst to hypothesize the reason for the poor forecast.

e. In other words, in a complex world of short-term forecasting, where no one forecasting methodology is consistently superior and where difficulties are present in all validation criteria, the CAA system demonstrated capability of reducing error. Furthermore, it provides a means of flagging sources of greatest potential error, where expertise of transportation analysts may be used to greatest value.

4-7. ADDITIONAL FINDINGS BASED ON THE DATA

a. The need to evaluate forecasting methodology using multiple criteria should be reemphasized. In the five series where error results for Winters were as large as 100 percent and were also worse than the Box-Jenkins results (see Table 4-1), both the fit and the accuracy statistics indicated that the Box-Jenkins was the better model. However, in the nine series in which Box-Jenkins error results were worse, the accuracy favored Winters in only three series; the fit statistic favored Winters in six. Hence, if the percentage error based on total tonnage is used to identify distinctly poor models, the fit statistic can alternate with the accuracy statistic with respect to effectiveness in selecting the "better" set of forecasts.

b. Although it cannot be definitely known whether extreme differences in results are attributable to defects in the models or in the criteria used to validate the models, the nine Box-Jenkins models referred to in the preceding paragraph should be highlighted for reevaluation.

c. An improvement could be built into all Box-Jenkins models developed for this study. An initial Box-Jenkins model could be fit on a series shortened by 1 year, to best predict the last year of observed values (i.e., fit the model to the criterion on which evaluation of "best" forecast is determined). Once the best model form is identified for the shortened series, new parameters are estimated for the total time series from which the forecasts are determined. This procedure would, of course, markedly increase the time required to produce a Box-Jenkins forecast, but it would reduce inconsistencies between accuracy and fit criteria used to evaluate the different methods.

d. To reiterate, using the percentage error criterion, 15 distinct series were identified with 100 percent or greater error associated with forecasts from at least one of the two methods. "Suspect" models could thus be inferred. Using the accuracy criterion, 8 out of 14 of such suspect models would have been rejected and forecasts based on the "correct" methodology. Using the fit criterion, 11 out of 14 of the suspect models would have been rejected. Thus, neither criterion behaves consistently well in identifying the best model.

e. If only one criterion is to be retained as part of the decision process for choosing between alternate forecasting methods, then the accuracy criterion is recommended **a priori** because of its traditional application in the forecasting field. Examination of results based on both fit and accuracy criteria, however, as well as reference to some measure of error, can be extremely valuable in highlighting models which need to be reevaluated.

f. The major thrust of this discussion should be to accentuate the wisdom of building a forecasting system on (at least) two methodologies. Results reported in this study are based on a substantial number of time series, many more than are usually reported in the literature. Consistent observations favoring one or the other of the methods have been difficult to make. For the majority of the series, both methods functioned similarly in forecasting effectiveness. A few problem series, where one or even both methods failed, however, could be identified. In this field of short-term forecasting, where caution is so necessary, capability to detect these danger signals justifies retention of a complex system using more than one forecasting methodology evaluated on the basis of multiple criteria.

4-8. CONCLUSIONS, CONTRIBUTIONS, AND EXTENSIONS

a. Conclusions. CAA has developed a forecasting system in which two alternate forecasting methodologies can be applied to historical time series and a choice made to determine the "better" of two sets of forecasts. The task of choosing between forecast results in an area where clear-cut criteria for evaluating forecast accuracy do not exist is an ambitious undertaking. The wisdom of providing for alternate results, however, has become apparent on the basis of a large series of analyses. It is not that all results between the alternate forecasting methodologies are so different, but rather that, in a few instances, results based on one or both methods are very poor. That is, historical behavior of certain time series has little relation to the future behavior being forecast. In that distinctly poor results

are indicative of time series where historical statistical forecasting methodology is inappropriate, expertise of functional analysts should take precedence over such results in specifying tonnage of future shipments.

b. Contributions. The predominant contributions of this study are described in the following paragraphs.

(1) First, the forecast system has begun with the classic Box-Jenkins methodology. This approach, the "Cadillac" of forecasting methodologies, is known for accuracy and serves as a standard for comparisons when evaluating other forecasting methodologies.

(2) Effectiveness of an advanced exponential smoothing approach (the Winters method) has been demonstrated with respect to forecasting accuracy.

(3) Conclusions in this study are based on a substantial quantity of data. Alternate forecasting methodologies are applied and comparative results obtained on 66 time series chosen to include the heaviest transportation routes for eight different commodities and three modes of transportation. Usual reports evaluating time series methodology include only a few series.

(4) Only on the basis of evaluations determined from this data, it becomes quite clear that incorporation of alternate methodologies, evaluated on multiple criteria, is essential to developing an effective forecasting system.

(5) Also from this data, it is apparent that certain forecasts are highly likely to be valid forecasts. It is also apparent that other forecasts are suspect, indicative of data series in which historical behavior will bear no relation to future values. For such series, the expertise of functional analysts is likely to be superior to the statistical results.

(6) Results are evaluated on the basis of the best known criteria which can be applied to any forecasting methodology, other than waiting for the passage of time. These criteria are critically evaluated in this report. Retention of multiple criteria is essential to development of accurate forecasts.

(7) This is a forecasting system which can be modified and improved. The most apparent change would be to replace the classic, but extremely time-consuming, Box-Jenkins procedure by one of the automatic Box-Jenkins procedures. It is essential, however, to evaluate any change on the basis of a comprehensive system of data using criteria described in this report. In that few operations research methodologies are applicable to all possible types of data, it is highly recommended that the basic logic inherent in this investigation be retained. That is, time series analysis should proceed, utilizing alternative methodologies with multiple criteria to identify the best results.

(8) Forecasting methods are applicable to other transportation systems.

c. Extensions. On the basis of this research, a number of areas requiring additional investigation become readily apparent.

(1) More information is needed on currently used forecasting methods, such as auto-Box-Jenkins or state-space forecasting, that could be used to improve the given forecasting system.

(2) Prototypes of time series which serve to distinguish alternate methodologies need to be identified.

(3) In a preliminary screening of all data, specialized statistical techniques should be applied to detect time series unsuitable for analysis or to identify irregularities in the data which are modifiable.

CHAPTER 5

SATISFACTION OF THE ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

5-1. WHAT OVER-OCEAN CARGO LIFT REQUIREMENTS CAN BE ACCURATELY PREDICTED BY ROUTE BETWEEN SHIPPING AREAS, BY COMMODITY, AND BY MODE? The 409 cargo routes, 12 commodities, and 3 transportation modes produced 2,267 route-commodity-mode combinations with data in the data base. Only 562 data records from these combinations were retained for forecasting. The remainder of the data records were excluded from being forecast because the data base had insufficient data to merit forecasts. The rules which were used to exclude routes from being forecast are described in Appendix D. The best estimate of the FY 86 forecasts was a comparison of FY 84 forecast with FY 84 actual movements. This estimate is contained in Chapter 4.

5-2. WHAT ARE THE FORECASTS OF OVER-OCEAN SEALIFT REQUIREMENTS FOR FY 1986 USING THE WINTERS MODEL AND BOX-JENKINS METHOD? The FY 86 cargo forecast of 562 route-commodity-mode combinations using the Winters Model and the Box-Jenkins method was approximately 3 million tons of cargo (3,275,201 tons). For details of the Winters forecast, see Appendix F. For details of the Box-Jenkins forecast, see Appendix H.

5-3. WHAT STATISTICAL PACKAGES CONTAINING FORECASTING MODELS OR METHODS ARE AVAILABLE FOR USE FOR THE COMPUTER FACILITIES AT MTMC? The statistical software to produce Winters forecasts was provided to MTMC as part of the audit trail. For a program listing of the Winters Statistical Programs, see Appendix G. The statistical software used at CAA to produce the Box-Jenkins forecast is part of a copyright product, the Biomedical Statistics Package. A statistical package has been ordered by MTMC.

5-4. WHAT PROGRAMS DEVELOPED BY CAA DURING THE TWF STUDY AND ITS IMPLEMENTATION ARE REQUIRED BY MTMC TO PRODUCE FUTURE FORECASTS?

a. Four categories of utility programs have been developed by CAA in order to produce the FY 86 forecast. Data base utility programs is the first type. These are described and listed in Appendix E. Box-Jenkins forecasting aids is the second utility type. These are described and listed in Appendix I. The third type, Winters forecasting aids and the Winters forecasting software, are described and listed in Appendix G. The integration software which selects and integrates forecasts from different files and writes the forecast in correct format is the fourth type; these are described and listed in Appendix J.

b. A computer audit tape and a printout with program listings plus data benchmarks for all four categories of utility programs were provided to MTMC on 7 June 1985 for their use.

5-5. WHAT ACTIONS MUST MTMC ACCOMPLISH TO DEVELOP A SYSTEM FOR THE PRODUCTION OF FUTURE FORECASTS?

a. Maintain a data base which provides cargo lift data aggregated by month and sorted by route-commodity-mode.

b. Obtain and install a statistics package on the MTMC computer.

c. Reproduce the CAA FY 86 forecast using the Box-Jenkins and the Winters software provided by CAA.

d. Provide cargo estimates for routes which are excluded from forecasting because of a lack of data points.

e. Integrate cargo forecasts with cargo estimates for excluded routes.

CHAPTER 6

FINDINGS

6-1. PROJECT IMPLEMENTATION

a. The FY 86 forecast of 562 routes was produced and delivered to MTMC on 25 March 1985.

b. The audit trail of the method was delivered to MTMC on computer tape on 7 June 1985 and the contents of the tape reviewed with MTMC personnel on 24 June 1985.

c. MTMC analysts are being provided consulting services on the use of CAA software through 30 September 1985. The next step toward an operational forecast capability at MTMC is for them to reproduce the CAA FY 86 forecast.

6-2. FORECASTING QUALITY ASSURANCE

a. The FY 84 backcasting results suggests functional transportation forecasts need to be added to the CAA methodology for routes and commodities whose FY 84 actual shipments show little correlation to the FY 78 to FY 83 data record.

b. Retention of both the Winters and the Box-Jenkins forecasting methods in the methodology will increase the forecast accuracy.

c. These findings are based upon a substantial quantity of data. Alternate forecasting methods are evaluated using multiple criteria, all applied to 66 time series. Usual reports on time series analysis include only a few series.

d. The value of these data is that it becomes quite clear which forecasts can be expected to be valid and which are suspect. Furthermore, all general recommendations on how to conduct a massive forecasting effort are clear, but only because of information contained in these data.

6-3. RECOMMENDED ACTIONS

a. Comparing the last year's forecast against last year's actual shipments should be accomplished each year before forecasting future year shipments. This first stage of forecasting is enhanced by a computer graphics capability.

b. Conventional Box-Jenkins forecasts are very costly in highly qualified professional man-months to produce and additional automated forecasting methodologies should be tested as a potential means of increasing the productivity of forecasting analysts and the accuracy of route forecasts.

APPENDIX A

STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Directors

LTC James Keenan, Force Systems Directorate - January-March 1985
Mr. Harold Frear, Force Systems Directorate - April-September 1985

b. Team Members

Mr. Bret Graham
Dr. Betsy Abbe
MAJ Jeffrey Sorenson

c. Other Contributors

Mr. Alex Martin
Mr. Dan Lundy
Mr. Walter Aldridge
Mr. Tom Johnson
Mr. Franklin Womack

2. PRODUCT REVIEW BOARD

Mr. Ernie Rose, Chairman
Ms Vera Hayes
LTC Robert Emerick

APPENDIX B

STUDY DIRECTIVE

DEPARTMENT OF THE ARMY
HEADQUARTERS MILITARY TRAFFIC MANAGEMENT COMMAND
5611 COLUMBIA PIKE
FALLS CHURCH VA 22041-5050

REPLY TO
ATTENTION OF

15 April 1985

MT-C

SUBJECT: Transportation Workload Forecasting - Implementation Project

Director
US Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

1. Purpose of Study Directive. This directive tasks the Concepts Analysis Agency (CAA) to perform the subject project.

2. Project. Transportation Workload Forecasting - Implementation.

3. Background.

a. Current forecasting procedures directed by AR 55-30 of Army cargo and mail workload requirements prescribe input from seventeen major commands/agencies/activities, worldwide. These consolidated requirements are submitted by HQDA to the Military Sealift Command (MSC) and the Military Airlift Command (MAC) in accordance with Joint Chiefs of Staff Publication 15. MSC and MAC utilize this data to generate their industrial fund budgets. History reveals significant variances in forecasted requirements versus actual lift, which results in distorted budgets by both the shipper service and MSC/MAC.

b. CAA conducted a study of the current system and concluded that more accurate and efficient forecasting could be achieved. Essential to improving forecasting was performing this function at a single location and using the Box-Jenkins method or the Winters model as the principal tools. ODCSLOG directed that the Military Traffic Management Command (MTMC) perform the over-ocean cargo forecasting for the Army beginning with the FY 85 input. CAA agreed to provide assistance to implement the forecasting system at the designated agency.

4. Study Proponent and Study Proponents Study Director.

HQ MTMC is the Study proponent. LTC J. Paepcke will be the proponent's Study Director.

5. Statement of the Problem.

a. MTMC is currently unable to perform the forecasting function because of the absence of the required capabilities at MTMC.

b. Purpose. To develop the FY 86 long range surface cargo over ocean forecasts and to assist MTMC in their implementation of a forecasting system.

c. Scope. The project will focus on developing the FY 86 long range over-ocean surface cargo forecast only and on implementing a forecasting system using the Winters model and Box-Jenkins method at MTMC.

d. Objectives.

(1) Produce 75 percent of the FY 86 over-ocean surface cargo lift requirement using Box-Jenkins method and 98 percent using the Winters model.
(2) Assist MTMC in implementing a surface cargo forecasting system at MTMC to produce the FY 87 forecasts.

e. Tasks.

(1) Obtain and evaluate cargo lift data from FY 78 to FY 84 to determine its suitability to produce specific route forecasts.
(2) Determine the number of route forecasts that can be produced prior to 1 March 1985.
(3) Produce, compare, and analyze forecasts of over-ocean cargo lift requirements using the Box-Jenkins method and the Winters model.
(4) Deliver forecasts on magnetic tape in prescribed format to MTMC.
(5) Provide an interim report to MTMC containing the FY 85 long range forecast, the forecast model parameters, the Winter model program, and an audit trail of the generation of the FY 86 long range forecasts.
(6) Assist MTMC to implement an over-ocean cargo forecasting system.
(7) Publish final report.

f. Timeframe. FY 85-86.

g. Assumptions.

(1) Historic lift data accurately reflects actual cargo transported.
(2) Original study team members are available to participate in the project and are augmented as necessary.

h. <u>Essential Elements of Analysis (EEA).</u>

(1) Determine what over-ocean cargo lift requirements can be accurately predicted by route between shipping areas, by commodity, and by mode given the available data.

(2) What the forecasts are for over-ocean sealift requirements for FY 86 using the Winters model and Box-Jenkins method.

(3) What programs developed by CAA during the TWF Study and its implementation are required by MTMC to produce future forecasts.

(4) What statistical packages containing forecasting models or methods are available for use for the computer facilities at MTMC.

(5) What actions must MTMC accomplish to develop a system for the production of future forecasts.

7. <u>Responsibilities.</u>

a. <u>The MTMC will:</u>

(1) Provide cargo lift data aggregated by month and sorted by route (area to area), commodity, mode, and by order of importance. The data will be expressed in measurement tons and will provide lift data from FY 78 to FY 84 inclusive.

(2) Provide one computer systems analyst and one statistician/analyst to CAA to assist in the development of the FY 86 forecast and to become familiar with the forecasting process.

(3) Prepare an evaluation of the study IAW AR 5-5.

(4) Consolidate forecasts for transmission to MSC.

b. <u>CAA will:</u>

(1) Establish a project team.

(2) Establish direct communications with ODCSLOG, MTMC, MSC, and other agencies as required for the conduct of the study.

(3) Conduct the project.

8. <u>Literature Search.</u>

a. CAA, Transportation Workload Forecasting Study, January 1984.

b. Department of the Army, Office of the Comptroller of the Army, Report.

c. US Army Logistics Evaluation Agency, Evaluation of Second Destination Transportation Funding, 29 December 1978.

d. Defense Logistics Agency studies and reports.

e. USAF and USN transportation workload forecasting methodologies.

9. References.

a. JCS Pub 15, dated 2 June 1975.

b. AR 55-23, dated 17 March 1978.

c. AR 55-30, dated 15 August 1982.

d. AR 55-133, dated 18 February 1977.

e. AR 59-8, dated 20 August 1982.

f. MECHTRAM Users Manual, dated June 1978.

g. AR 11-18, October 1975.

h. AR 11-28, December 1975.

10. Administration.

a. Support. Funding for temporary duty (TDY) and travel associated with the study will be provided by each participating agency.

b. Milestone Schedule.

Data from MTMC	11 December 1984
Determination of forecast capabilities	15 January 1985
Delivery of forecast	15 March 1985
Delivery of Programs	1 April 1985
System Operational at MTMC	30 September 1985
Final Report	30 September 1985

c. Control Procedures.

(1) Periodic In Process Reviews will be provided to the study sponsor by the project team.

(2) Documentation required by AR 5-5, will be submitted by CAA.

d. Coordination.

(1) Direct coordination between CAA, MTMC, DALO-TSP, and MSC is authorized.

(2) This directive has been coordinated with CAA.

HAROLD I. SMALL
Major General, USA
Commanding

4

APPENDIX C

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DEPARTMENT OF THE ARMY

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AR 55-23, Submission of Dry Cargo Requirements and the Assignment and Allocation of Sea Transportation Space

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APPENDIX D

DATA BASE

D-1. GENERAL. This appendix details the procedure taken to form a data base suitable for creation of the annual forecast.

D-2. DATA BASE CREATION. There were three principal steps involved in the development of the data base: (1) raw data screening, (2) route prioritization, and (3) data reduction.

a. Raw Data Screening. The tape sent by MTMC to CAA was converted to the Sperry 1100/84 and copied to a system data file. The raw data base was composed of 37,905 records (card images). Each record contained 24 columns of information, formated as shown in Table D-1. A program (IDENTITY) was written and applied to the raw data base in order to detect any spurious data entries. The program was designed to search the subfields specified in Table D-1 and to identify all unique character strings as to the line (record) of first occurrence and the number of subsequent occurrences. No erroneous entries were discovered in the first three subfields. In the fourth subfield (Transportation Mode), the codes B, C, and M occurred 19,352, 17,468, and 1,066 times, respectively. Blanks appeared in this subfield a total of 19 times. In subfields 5 and 6, there were 47 distinct ports of debarkation (POD) and 48 unique ports of embarkation (POE). The entry '00' appeared in these subfields three and four times, respectively. In the seventh subfield (COMMODITY TYPE), the codes shown in the right-hand column of Table D-1 appeared with the frequencies listed in Table D-2. Blank entries in this subfield occurred 26 times.

b. Route Prioritization. A program (ROUTES) was written to concatenate points of embarkation/debarkation into unique four-digit routes and to rank order the routes according to decreasing levels of shipment tonnage. It was determined that there were 409 unique routes in the raw data base. A listing of these routes is provided as Table D-3. The most active routes appear in the top row, while the least active routes can be found in the bottom row. A cross-reference list for the four-digit routes of Table D-3 has been presented as Table D-4. For example, the most active route is the first entry of Table D-3, '0117'. The two-digit POE/POD codes of Table D-4 indicate that this route is East Coast to Europe. Note from Table D-3 that shipments in the opposite direction, that is, from Europe to East Coast, rank third in overall tonnage.

c. Data Reduction. Before beginning the data reduction phase, all records containing aberrative subfields were corrected. It was discovered that 120 duplicate records were appended to the data base supplied by MTMC; these records were deleted. At this point, in order to achieve a prioritization of forecasts, multistage sorting of the raw data base began. Three programs were written:

(1) The first routine (CREATE-TWFI/DATA-BASE1) rearranged the 37,785 scrambled records in the raw data base (file G49186) according to Table D-3, so that all records for route '0117' appeared at the top, followed by those records corresponding to route '0217' next, and so on, until the single record associated with route '3230' appeared at the bottom. This rearranged data file was called G4TWFIDAT1.

(2) The second routine (CREATE-TWFI/DATA-BASE2) used the output (G4TWFIDAT1) of the first routine as its input. For each route, it formed a list of commodity-mode pairs and computed an aggregate shipment tonnage for each month in the data base. If no cargo was shipped for a given month during the shipment activity period, then a zero-entry was created for the month. Finally, for each commodity-mode pair, the aggregated monthly shipments were sorted chronologically and written as a raw time series (with a route-commodity-mode header) to an output file (G4TWFIDAT2).

(3) The third routine (CREATE-TWFI/DATA-BASE3) used the output (G4TWFIDAT2) of the second routine as its input. For each route, it rank ordered the commodities by decreasing shipment weight, using as a sorting criterion the aggregate tonnage computed over the three modes of transportation. Finally, within each commodity, the raw time series were rearranged so that the busiest mode of transportation appeared first. This third (and final) sorted data file was called G4TWFIDAT3. The data was now in a form suitable for forecasting.

Table D-1. Data Format

Columns	Data entry	Codes
1-2	Fiscal year	78-84
3-4	Sail year	77-84
5-6	Sail month	01-12
7	Mode	B = Breakbulk C = Container M = MILVAN
8-9	POE Traffic area	See Table D-4
10-11	POD Traffic area	See Table D-4
12-13	Commodity	11 = Chill 15 = Freeze 20 = Bulk, except coal 22 = Coal 30 = POV 40 = Ammo 60 = General except household goods (HHG) and CONEX 61 = HHG 66 = CONEX 70 = Trailers 80 = Special 90 = Aircraft
14-24	Lift (measurement tons)	0 - 999,999,999.99

Table D-2. Commodity Frequencies

Commodity code	Frequency of occurrence
--	26
11	1,343
15	1,238
20	222
22	73
30	8,347
40	2,162
60	13,186
61	5,239
66	1.071
70	307
80	4,600
90	91

Table D-3. Rank-ordered Routes

UNCLASSIFIED*G4TWFI(1).ROUTES/LIST(0)

1	0117	0217	1701	0351	1702	0327	0425	0119	0350	2727	1817	0119	0114	0156	0120	0352
2	0451	2703	0356	0332	0317	0329	1718	5217	2020	0127	0256	0151	0123	2504	5251	0329
3	0251	5103	2001	5051	0218	4601	1401	5601	1720	1901	2701	0427	5203	1002	0301	0145
4	0211	0103	0277	0214	1801	0452	0450	0210	0456	5602	0115	1417	5101	1301	5102	0203
5	0102	5232	5152	1703	2803	0220	0223	0749	0171	1102	1502	1501	5233	0219	5250	5052
6	1902	0113	0215	5003	1751	0101	2704	1004	1402	0417	5603	0129	1852	1003	0410	1101
7	0432	0152	0310	5729	5127	0132	0302	2751	0330	0314	5227	0111	5201	3750	3251	2002
8	2728	3203	2702	5132	2903	0349	0333	1717	3003	5252	0252	0108	1723	0201	1917	1851
9	0415	5104	0232	1719	3052	5204	5732	2729	1708	0144	1504	3252	0304	5150	5320	5001
10	1725	0250	1413	0150	2927	0323	2017	2752	2732	0221	1919	0107	3051	5027	0149	1802
11	1820	0428	0437	1313	1920	5614	2951	2901	2734	3523	0315	1707	0145	0303	3201	2301
12	0222	0244	0122	0116	5230	1456	0104	1714	5202	3032	5117	0110	3427	1721	3829	0130
13	0429	3403	2713	2902	5256	2019	0109	5032	3603	1314	0124	5645	2801	5002	0133	2302
14	1756	0318	3227	3050	3001	1921	2738	0338	3257	0339	5317	1115	5004	3017	3202	0449
15	3229	1903	1403	3852	3519	1001	1850	2317	2750	1704	1818	0213	1452	1903	5149	2827
16	1749	1201	2932	3827	2904	3034	0229	5030	0100	3832	5129	1727	0233	5249	0403	0426
17	5610	0340	1746	0134	0901	5703	0230	0433	0245	0334	0001	2950	1724	5029	3303	5056
18	1819	4029	0344	0112	1918	1601	0501	2952	5133	0224	5033	1114	2940	3401	1951	2739
19	1821	2320	3204	3217	2929	0430	0154	3350	5130	0319	1752	3002	2829	0709	1922	5617
20	3233	2401	0801	1415	2878	3304	5615	2402	1015	2749	2018	5644	0324	3351	3027	4402
21	0439	0257	4501	1709	2314	0143	3029	1823	0401	1722	0357	1949	0234	4952	2323	0917
22	2004	0322	1904	1930	0204	2024	1302	0402	2851	1923	0320	3804	1317	0444	0345	3704
23	3703	1734	0419	0313	0434	4502	1700	2003	3352	0918	2101	4456	5224	5214	1315	1556
24	2604	1750	5125	3402	3249	1900	0105	4504	1729	1804	4401	0414	2049	2303	1145	3828
25	3033	2021	1733	0701	5234	1745	4901	2717	3404	1946	4904	1730	1110	2319	1713	2952
26	5604	0438	2576	2730	2928	0418	3049	3224	3270							

Table D-4. POE/POD Codes

Code	Location	Code	Location	Code	Location
01	East Coast	29	Marianas	56	Panama Pacific
02	Gulf Coast	30	Taiwan	57	Indian Ocean
03	California Coast	31	Bonin Islands	58	Not used
04	Northwest Coast	32	Philippines	59	Not used
05	Newfoundland	33	Thailand	60	East Coast North
06	Labrador	34	New Guinea/Australia	61	East Coast South
07	Pine Tree	35	Great Lakes	62	Gulf Coast East
08	Thule	36	Not used	63	Gulf Coast West
09	Iceland	37	Aleutians	64	California North
10	West Mexico/Central America	38	North Central Pacific	65	California South
11	Panama Atlantic	39	South Pacific	66	Northwest Coast
12	Bermuda	40	Southwest Pacific	67	North Atlantic NW
13	Lesser Antilles	41	Not used	68	North Atlantic SW
14	Puerto Rico	42	Not used	69	North Atlantic NE
15	Caribbean	43	Black Sea	70	North Atlantic SE
16	Guantanamo Bay	44	West Coast South America	71	North Atlantic S Eur
17	Europe	45	East Coast South America	72	North Atlantic BI
18	British Isles	46	Azores	73	Mediterranean
19	West Mediterranean	47	Antarctica	74	South Atlantic West
20	East Mediterranean	48	Vietnam	75	South Atlantic East
21	West Africa	49	Southeast Asia, Other	76	Indian Ocean West
22	South and East Africa	50	Ryukyu Islands	77	Indian Ocean East
23	Arabian Gulf	51	Korea	78	South Pacific West
24	India/Burma	52	Japan	79	South Pacific East
25	East Alaska	53	Mississippi River	80	North Pacific West
26	West Alaska	54	Rhine River	81	North Pacific East
27	Hawaiian Island	55	Cambodia	82	North Pacific PAC Coast
28	Marshall Islands				

APPENDIX E

DATA BASE SOFTWARE

E-1. GENERAL. This appendix presents the symbolic code for the five routines described in Appendix D. Magnetic tape copies of these five routines were delivered to MTMC, as were the runstreams used to define their input and execution (see files 1 and 2 in Appendix L, Table L-1).

E-2. SOFTWARE LISTINGS

a. IDENTITY. The program IDENTITY searches subfields of data records to identify all unique character strings. In the study, the runstream IDENTITY17/TWIF specifically searched subfields 1 through 7 of the raw data base G49186 (input unit 2). A listing of IDENTITY is provided as Figure E-1.

b. ROUTES. The program ROUTES determines unique concatenated routes and rank orders them according to decreasing levels of shipment tonnage. Specifically, the runstream TWFIRTELOCAT determined that the raw data base G49186 (input unit 2) contained 409 distinct routes. It also wrote these 409 routes to output unit 11, and then copied them back into the program file G4TWFI as the element ROUTES/LIST. A listing of ROUTES is given as Figure E-2.

c. CREATE-TWFI/DATA-BASEi. There are three programs required to perform the various levels of sorting required. The programs are executed sequentially, and the literal "i" in the name above is used to designate 1, 2, or 3. The initial input to the first of these programs is the raw data base G49186 (input unit 2). Subsequent input files are the outputs of previous runs. The output of the third program is the final raw data base G4TWFIDAT3. Runstreams have the same names as the absolute elements they execute. Listings of these three programs are given in Figures E-3, E-4, and E-5.

```
UNCLASSIFIED*S4T*FI(1).IDENTITY(19)
      DIMENSION A(7),C(1000,7),REC(1000,7)
      DIMENSION N(7),NF(1000,7),NR(1000,7)
      CHARACTER*2 A,C
      CHARACTER*24 REC,RECORD
      CHARACTER*80 FMT
C
   10 FORMAT(2I3)
   15 FORMAT(A80)
   20 FORMAT(A24)
   25 FORMAT(1H1/55X,' INPUT FIELD NUMBER ',I2//)
   30 FORMAT(17X,' FIELD ',A2,' IN RECORD ',A24,' OCCURS ',I5,' TIMES,',
     +       ' FIRST OCCURRENCE AT RECORD # ',I5)
C
      READ(5,10) JMIN,JMAX
      READ(5,15) FMT
C
      NREC=0
  100 READ(2,FMT,END=999) (A(J),J=JMIN,JMAX)
      READ(0,20) RECORD
      NREC=NREC+1
C
      DO 200 J=JMIN,JMAX
      IF (NREC .EQ. 1) THEN
         N(J)=1
         NF(1,J)=1
         NR(1,J)=1
         C(1,J)=A(J)
         REC(1,J)=RECORD
      ELSE
         DO 300 I=1,N(J)
         IF (C(I,J) .EQ. A(J)) THEN
            NR(I,J)=NR(I,J)+1
            GO TO 200
         ELSE IF (I .EQ. N(J)) THEN
            N(J)=N(J)+1
            NF(N(J),J)=NREC
            NR(N(J),J)=1
            C(N(J),J)=A(J)
            REC(N(J),J)=RECORD
         ENDIF
  300    CONTINUE
      ENDIF
  200 CONTINUE
C
      GO TO 100
C
  999 DO 400 J=JMIN,JMAX
      PRINT 25,J
C
      DO 500 I=1,N(J)
      PRINT 30,C(I,J),REC(I,J),NR(I,J),NF(I,J)
  500 CONTINUE
C
  400 CONTINUE
C
      END
```

Figure E-1. IDENTITY

```
UNCLASSIFIED*34T,FI(1).ROUTES(12)
          DIMENSION NF(900),NR(900),ROUTE(900),REC(900),NY(900)
          DIMENSION TONS(900),CTONS(900)
          CHARACTER*2 POE,POD
          CHARACTER*4 POEPOD,ROUTE
          CHARACTER*24 REC,RECORD
C
       10 FORMAT(7X,2A2,2X,F11.2)
       15 FORMAT(A24)
       20 FORMAT(1H1/51X,' TOTAL NUMBER OF ROUTES IS ',I4//)
       25 FORMAT(16X,' ROUTE ',A4,' IN RECORD ',A24,' OCCURS ',I5,' TIMES,',
     +       ' FIRST OCCURRENCE AT RECORD # ',I5)
       30 FORMAT(16(1X,A4))
       35 FORMAT(1H1/13X,' CUMULATIVE TONNAGE BY RANKED ROUTES'//
     +  5X,'ROUTE',11X,'TONS',7X,'CUM TONS','   PERCENT')
       40 FORMAT(6X,A4,2F15.2,F10.3)
C
          NREC=0
      100 READ(2,10,END=999) POE,POD,WGT
          READ(3,15) RECORD
          NREC=NREC+1
          POEPOD=POE//POD
C
          IF (NREC .EQ. 1) THEN
             N=1
             NF(1)=1
             NR(1)=1
             ROUTE(1)=POEPOD
             REC(1)=RECORD
             TONS(1)=WGT
          ELSE
             DO 200 I=1,N
             IF (ROUTE(I) .EQ. POEPOD) THEN
                NR(I)=NR(I)+1
                TONS(I)=TONS(I)+WGT
                GO TO 100
             ELSE IF (I .EQ. N) THEN
                N=N+1
                NF(N)=NREC
                NR(N)=1
                ROUTE(N)=POEPOD
                REC(N)=RECORD
                TONS(N)=WGT
             ENDIF
      200    CONTINUE
          ENDIF
          GO TO 100
C
      999 DO 300 I=1,N
          NY(I)=I
      300 CONTINUE
C
          CALL ORDERD(N,TONS,NY)
C
          PRINT 20,N
          DO 400 I=1,N
          PRINT 25,ROUTE(NY(I)),REC(NY(I)),NR(NY(I)),NF(NY(I))
      400 CONTINUE
C
          WRITE(11,30) (ROUTE(NY(I)),I=1,N)
C
          CUMWGT=0
          DO 500 I=1,N
          CUMWGT=CUMWGT+TONS(I)
          CTONS(I)=CUMWGT
      500 CONTINUE
C
          PRINT 35
          DO 600 I=1,N
          PCT=CTONS(I)/CTONS(N)
          PRINT 40,ROUTE(NY(I)),TONS(I),CTONS(I),PCT
      600 CONTINUE
C
          END
```

Figure E-2. ROUTES

```
UNCLASSIFIED*S4TWFI(1).CREATE-TWFI/DATA-BASE1(15)
            DIMENSION ROUTE(400)
            CHARACTER*24 RECORD
            CHARACTER*2 POE,POD
            CHARACTER*4 POEPOD,ROUTE
            INTEGER OUNIT,UNIMAX
      C
         10 FORMAT(I3)
         15 FORMAT(16(1X,A4))
         20 FORMAT(A24)
         25 FORMAT(7X,2A2)
      C
            READ(5,10) NROUTE
            READ(5,15) (ROUTE(I),I=1,NROUTE)
      C
            KCYCLE=0
      C
        100 KCYCLE=KCYCLE+1
            IF (KCYCLE .EQ. 1) THEN
               IUNIT=2
               OUNIT=3
            ELSE IF (KCYCLE .EQ. 2) THEN
               IUNIT=3
               OUNIT=4
            ELSE
               IF (IUNIT .EQ. 3) THEN
                  IUNIT=4
                  OUNIT=3
               ELSE
                  IUNIT=3
                  OUNIT=4
               ENDIF
            ENDIF
      C
            KROUTE=(KCYCLE-1)*10+1
            NRTMAX=MIN0(NROUTE,KROUTE+9)
      C
            NREC=0
        200 READ(IUNIT,20,END=999) RECORD
            READ(0,25) POE,POD
            NREC=NREC+1
            POEPOD=POE//POD
      C
            DO 300 I=KROUTE,NRTMAX
            IF (ROUTE(I) .EQ. POEPOD) THEN
               MUNIT = 11 + I-KROUTE
               WRITE(MUNIT,20) RECORD
               GO TO 200
            ENDIF
        300 CONTINUE
      C
            WRITE(OUNIT,20) RECORD
            GO TO 200
      C
        999 UNIMAX = 11 + NRTMAX-KROUTE
            DO 400 MUNIT=11,UNIMAX
               REWIND MUNIT
        410    READ(MUNIT,20,END=420) RECORD
               WRITE(9,20) RECORD
               GO TO 410
        420    REWIND MUNIT
        400 CONTINUE
      C
            IF (NRTMAX .NE. NROUTE) THEN
               REWIND IUNIT
               REWIND OUNIT
               GO TO 100
            ELSE
               STOP
            ENDIF
      C
            END
```

Figure E-3. CREATE-TWFI/DATA-BASE1

```
UNCLASSIFIED*54TWFI(1).CREATE-TWFI/DATA-BASE2(5)
      DIMENSION N(35),COMMOD(35),DATE(95),NY(96)
      DIMENSION DAT(36,96),NDAT(36,96),TONAGE(36,96)
      DIMENSION CMLIST(12)
      INTEGER DAT,DATE,YRMO
      INTEGER YRI,YRF,YRMOI,YRMOF,DELYR,YRP,YRMOP
      CHARACTER*1 STAR,MODE
      CHARACTER*2 COM,POE,POD,CMLIST
      CHARACTER*3 CMPAIR,COMMOD
      CHARACTER*4 POEPOD,ROUTEL
C
      DATA STAR/ '*' /
      DATA CMLIST/ '11', '15', '20', '22', '30', '40',
     +             '60', '61', '66', '70', '80', '90' /
C
   10 FORMAT(2X,I4,A1,3A2,F11.2)
   20 FORMAT(A1,A4,1X,A3,2(1X,I2))
   30 FORMAT(1X,I4,F10.2,1X,I4)
   40 FORMAT(1H1,I5,' RECS READ, ',I5,' RECS USED, ','   STATUS = ',I5)
C
      NRECT=0
      NREC=0
      NCOM=0
  100 READ(2,10,END=550,IOSTAT=ITERM) YRMO,MODE,POE,POD,COM,TONS
      NRECT=NRECT+1
C
      DO 110 I=1,12
      IF (COM .EQ. CMLIST(I)) GO TO 120
  110 CONTINUE
      GO TO 100
C
  120 NREC=NREC+1
      CMPAIR=COM//MODE
      POEPOD=POE//POD
C
      IF (NREC .GT. 1   .AND.  POEPOD .NE. ROUTEL) GO TO 550
C
  200 ROUTEL=POEPOD
      IF (NCOM .EQ. 0) THEN
         NCOM=1
         I=NCOM
         COMMOD(1)=CMPAIR
      ELSE
         DO 300 J=1,NCOM
         IF (COMMOD(J) .EQ. CMPAIR) THEN
            I=J
            GO TO 400
         ELSE IF (J .EQ. NCOM) THEN
            NCOM=NCOM+1
            I=NCOM
            COMMOD(NCOM)=CMPAIR
         ENDIF
  300    CONTINUE
      ENDIF
C
  400 IF (N(I) .EQ. 0) THEN
         N(I)=1
         DAT(I,1)=YRMO
         NDAT(I,1)=1
         TONAGE(I,1)=TONS
      ELSE
         DO 500 K=1,N(I)
         IF (DAT(I,K) .EQ. YRMO) THEN
            NDAT(I,K)=NDAT(I,K)+1
            TONAGE(I,K)=TONAGE(I,K)+TONS
            GO TO 100
         ELSE IF (K .EQ. N(I)) THEN
            N(I)=N(I)+1
            DAT(I,N(I))=YRMO
            NDAT(I,N(I))=1
            TONAGE(I,N(I))=TONS
         ENDIF
  500    CONTINUE
      ENDIF
      GO TO 100
C
  550 DO 600 I=1,NCOM
C
      IF (N(I) .EQ. 1) THEN
         WRITE(11,20) STAR,ROUTEL,COMMOD(I),1,1
         WRITE(11,30) DAT(I,1),TONAGE(I,1),NDAT(I,1)
      ELSE IF (N(I) .GT. 1) THEN
```

Figure E-4. CREATE-TWFI/DATA-BASE2
(page 1 of 2 pages)

```
            DO 610 K=1,N(I)
            NY(K)=K
            DATE(K)=DAT(I,K)
   610      CONTINUE
C
            CALL ORDERA(N(I),DATE,NY)
C
            YRMOI=DATE(1)
            YRMOF=DATE(N(I))
            YRI=YRMOI/100
            YRF=YRMOF/100
            DELYR=YRF-YRI
            MOI=YRMOI-100*YRI
            MOF=YRMOF-100*YRF
            NMOYRI=12-MOI+1
            NMOYRF=   MOF
            IF (DELYR .EQ. 0) THEN
               NRANGE=MOF-MOI+1
            ELSE IF (DELYR .EQ. 1) THEN
               NRANGE=NMOYRI+NMOYRF
            ELSE IF (DELYR .GE. 2) THEN
               NMOBET=12*(DELYR-1)
               NRANGE=NMOYRI+NMOBET+NMOYRF
            ENDIF
            NNZERO=N(I)
            WRITE(11,20) STAR,ROUTEL,COMMOD(I),NRANGE,NNZERO
C
            YRP=YRI
            KZ=1
            DO 620 KR=1,NRANGE
            MOP=MOD(MOI+KR-2,12)+1
            IF (KR .GT. 1  .AND.  MOP .EQ. 1) THEN
               YRP=YRP+1
            ENDIF
            YRMOP=100*YRP+MOP
            IF (YRMOP .EQ. DAT(I,NY(KZ))) THEN
               WRITE(11,30) DAT(I,NY(KZ)),TONASE(I,NY(KZ)),NDAT(I,NY(KZ))
               KZ=KZ+1
            ELSE
               WRITE (11,30) YRMOP, 0.0, 0
            ENDIF
   620      CONTINUE
         ENDIF
C
   600   CONTINUE
C
         NCOM=0
         DO 700 I=1,35
         N(I)=0
   700   CONTINUE
C
         IF (ITERM .EQ. 0) THEN
            GO TO 200
         ELSE
            GO TO 999
         ENDIF
C
   999   PRINT 40,NRECT,NREC,ITERM
         STOP
C
         END
```

Figure E-4. CREATE-TWFI/DATA-BASE2
(page 2 of 2 pages)

```
UNCLASSIFIED*S4TWFI(1).CREATE-TWFI/DATA-BASE3(39)
                 INTEGER NRANGE,NNZERO,YRMO,SYRMO(12,3,200)
                 INTEGER SRANGE(12,3),SNZERO(12,3)
                 INTEGER X,Y,Z,EOF
                 INTEGER NPERMO,SNUPMO(12,3,200)
       C
                 REAL TONS,CMTONS(12,3,200),TTONS(12),HDTONS
       C
                 CHARACTER*1 STAR,MODE,SMODES(12,3)
                 CHARACTER POEPOD*4,SROUTE*4,CTYPES*2(12),COM*2
                 CHARACTER*2 CMDTY(12,3),STYPES(12),HDTYPE
       C
                 DATA CTYPES / '11','15','20','22','30','40','60','61','66','70',
                *              '80','90' /
       C
       5         READ(7,10,END=200,ERR=900) STAR,POEPOD,COM,MODE,NRANGE,
                *      NNZERO
       10        FORMAT(A1,A4,1X,A2,A1,2(1X,I2))
       C
                 IF(STAR .NE. '*') GO TO 900
                 GO TO 30
       C
       20        READ(7,10,END=100,ERR=900) STAR,POEPOD,COM,MODE,NRANGE,
                *      NNZERO
       C
                 IF(STAR .NE. '*') GO TO 900
                 IF(POEPOD .NE. SROUTE) GO TO 200
                 GO TO 40
       C
       30        SROUTE = POEPOD
       40        DO 45 I = 1,12
                    IF(COM .EQ. CTYPES(I)) THEN
                       X = I
                       GO TO 55
                    ENDIF
       45        CONTINUE
                 GO TO 910
       C
       55        Y = 0
                 IF(MODE .EQ. 'C') Y = 1
                 IF(MODE .EQ. 'B') Y = 2
                 IF(MODE .EQ. 'M') Y = 3
                 IF(Y .EQ. 0) GO TO 920
       C
                 CMDTY(X,Y) = COM
                 SMODES(X,Y) = MODE
                 SRANGE(X,Y) = NRANGE
                 STYPES(X) = COM
                 SNZERO(X,Y) = NNZERO
       C
                 DO 70 Z = 1,NRANGE
                    READ(7,65,END=930) YRMO,TONS,NPERMO
       65           FORMAT(1X,I4,F10.2,1X,I4)
       C
                    SYRMO(X,Y,Z) = YRMO
                    CMTONS(X,Y,Z) = TONS
                    CMTONS(X,Y,200) = CMTONS(X,Y,200) + TONS
                    SNUPMO(X,Y,Z) = NPERMO
       70        CONTINUE
                 GO TO 20
       C
       100       EOF = 1
       C
       200       DO 220 X = 1,12
                    DO 215 Y = 1,3
                       TTONS(X) = TTONS(X) + CMTONS(X,Y,200)
       215          CONTINUE
       220       CONTINUE
       C
                 L = 13
                 DO 250 J = 1,12
                    L = L - 1
                    IF(L .EQ. 1) GO TO 250
       C
                    DO 245 K = 2,L
                       IF(TTONS(K) .LT. TTONS(K-1)) GO TO 245
       C
                       HDTONS = TTONS(K-1)
                       TTONS(K-1) = TTONS(K)
                       TTONS(K) = HDTONS
       C
                       HDTYPE = STYPES(K-1)
```

Figure E-5. CREATE-TWFI/DATA-BASE3
(page 1 of 2 pages)

```
                STYPES(K-1) = STYPES(K)
                STYPES(K) = HDTYPE
C
245          CONTINUE
250     CONTINUE
C
260     DO 350 J = 1,12
           IF(STYPES(J) .EQ. '  ') GO TO 350
C
           DO 270 K = 1,12
              IF(STYPES(J) .EQ. STYPES(K)) X = K
270        CONTINUE
C
           DO 320 L = 1,3
              Y = 0
C
              IF(CMTONS(X,1,200) .GT. CMTONS(X,2,200) .AND.
     *           CMTONS(X,1,200) .GT. CMTONS(X,3,200)) Y = 1
              IF(CMTONS(X,2,200) .GT. CMTONS(X,1,200) .AND.
     *           CMTONS(X,2,200) .GT. CMTONS(X,3,200)) Y = 2
              IF(CMTONS(X,3,200) .GT. CMTONS(Y,1,200) .AND.
     *           CMTONS(X,3,200) .GT. CMTONS(X,2,200)) Y = 3
C
C
              IF(Y .EQ. 0) GO TO 320
              STAR = '*'
              WRITE(8,10) STAR,SROUTE,CMDTY(X,Y),SMODES(X,Y),
     *              SRANGE(X,Y),SNZERO(X,Y)
C
              N = SRANGE(X,Y)
              DO 290 Z = 1,N
                 WRITE(9,65) SYRMO(X,Y,Z),CMTONS(X,Y,Z),SNUPMO(X,Y,Z)
290           CONTINUE
              CMTONS(X,Y,200) = 0.
320        CONTINUE
350     CONTINUE
C
        DO 380 X = 1,12
C
           STYPES(X) = '  '
           TTONS(X) = 0.
C
           DO 375 Y = 1,3
C
              SRANGE(X,Y) = 0
              SNZERO(X,Y) = 0
              CMDTY(X,Y) = '  '
              SMODES(X,Y) = '  '
C
              DO 370 Z = 1,200
C
                 SYRMO(X,Y,Z) = 0
                 CMTONS(X,Y,Z) = 0.
                 SNUPMO(X,Y,Z) = 0
C
370           CONTINUE
375        CONTINUE
380     CONTINUE
C
        IF(EOF .EQ. 1) GO TO 1000
        GO TO 30
C
900     PRINT *, ' RECORD NOT HEADER RECORD '
        GO TO 1000
910     PRINT *, ' BAD COMMODITY NUMBER '
        GO TO 990
920     PRINT *, ' INVALID MODE '
        GO TO 990
930     PRINT *, ' ERROR IN NRANGE VALUE '
C
990     WRITE(6,991) STAR,POEPOD,COM,MODE,NRANGE,NNZERO
991     FORMAT(' ',1X,A1,A4,1X,A2,A1,2(1X,I2))
C
1000    STOP
        END
```

Figure E-5. CREATE-TWFI/DATA-BASE3
(page 2 of 2 pages)

APPENDIX F

WINTERS FORECASTS

F-1. GENERAL. This appendix describes special purpose code that was added to the Winters main program (WINTERDRV5) in order to exclude certain sparse routes from processing.

F-2. SPECIAL CONSIDERATIONS

a. Route-Commodity-Mode Combinations. The final sorted data file (G4TWFIDAT3) contains 2,267 route-commodity-mode combinations and their associated raw time series. A listing of these route-commodity-mode combinations is at Figure F-1.

b. Manually Excluded Routes. Visual survey of the raw time series appearing in G4TWFIDAT3 revealed that many of the time series were simply too sparse to fit by the Winters Model or any other technique. These route-commodity-mode combinations were identified, and a look-up table containing commodity-mode combinations for 30 different routes was stored as the element ROUTES/OMIT in the file G4TWFI. When WINTERDRV encounters a route-commodity-mode combination in G4TWFIDAT3 that has been flagged by ROUTES/OMIT, that route is bypassed, and control is passed to the next route in G4TWFIDAT3. A listing of the routes to be manually omitted appears in Figure F-2.

c. Manually Included Routes. It was originally planned to evaluate only selected routes after the first 30 routes, since the first 30 routes comprised 90 percent of the total cargo shipped. A look-up table containing those routes to be analyzed after the first 30 was stored as the element ROUTES/INCLUDE in the file G4TWFI. Ultimately, it was decided to examine all routes in the data base G4TWFIDAT3, and to discard those subject to an automatic exclusion logic. Thus, the look-up table ROUTES/INCLUDE is read in by WINTERDRV5, but is not actually used. It appears in this appendix as Figure F-3 for the sake of integrity of this report.

d. Automatically Included Routes. An automatic screening logic (proposed by MTMC) was implemented in order to eliminate those sparse time series that were not visually identified in Figure F-2. Five years or 60 months of data (FY 80 through FY 84) were used for the Winters fits, when available. The program performed a Winters fit for a given route-commodity-mode combination whenever the following criteria were satisfied:

(1) At least 36 shipment months in the data base (i.e., data for FY 82 through FY 84), and

(2) No occurrence of 12 consecutive nonshipment months between FY 80 and FY 83, and

(3) At least 2 consecutive shipment months during FY 84, or

(4) At least 3 nonconsecutive shipment months during FY 84.

Any time series containing fewer than 24 data points or having no shipment activity during FY 84 was discarded. In all other cases, the previous year's actuals (i.e., FY 84 data) were used in place of the Winters forecast.

e. Winters Forecasts. Of the initial 2,267 route-commodity-mode combinations, a total of 1,754 raw time series was discarded due to the shipment inactivity criteria outlined in the previous paragraph. Winters forecasts (or FY 84 actuals) were produced for the remaining 513 raw time series (Figure F-4).

```
*G4T.FI(1).HEADER(J)
*0117 60C *0117 60B *0117 60M *0117 20B *0117 80B *0117 80C *0117 80M *0117 20B
*0117 20C *0117 30C *0117 30B *0117 40B *0117 40M *0117 40C *0117 15C *0117 15B
*0117 61C *0117 61B *0117 61M *0117 66C *0117 66B *0117 66M *0117 11C *0117 11B
*0117 11M *0117 90B *0117 90C *0117 90M *0117 70B *0217 80B *0217 80C *0217 60C
*0217 60B *0217 60M *0217 30C *0217 30B *0217 30M *0217 61C *0217 61B *0217 61M
*0217 20B *0217 22B *0217 90B *0217 90C *0217 15C *0217 65B *0217 65C *0217 66M
*0217 11C *0217 40C *0217 40B *0217 40M *1701 30B *1701 30C *1701 30M *1701 61B
*1701 61C *1701 61M *1701 66B *1701 66M *1701 66C *1701 60M *1701 60B *1701 60C
*1701 80B *1701 30C *1701 30M *1701 40B *1701 40M *1701 40C *1701 70B *1701 20B
*1701 90C *1701 15C *0351 60C *0351 60B *0351 60M *0351 40B *0351 40C *0351 40M
*0351 80B *0351 60C *0351 60M *0351 30C *0351 30B *0351 30M *0351 15C *0351 11C
*0351 11M *0351 11B *0351 61C *0351 61M *0351 61B *0351 66C *0351 66B *0351 66M
*0351 70B *0351 90C *0351 20C *1702 60B *1702 80C *1702 80M *1702 30B *1702 30C
*1702 30M *1702 61B *1702 61C *1702 61M *1702 60B *1702 60M *1702 60C *1702 90B
*1702 66B *1702 66M *1702 66C *1702 70B *1702 11B *1702 40B *1702 40M *0327 60C
*0327 60B *0327 60M *0327 30B *0327 30C *0327 61C *0327 61B *0327 80B *0327 80C
*0327 40B *0327 40C *0327 40M *0327 15B *0327 15C *0327 11C *0327 11B *0327 66B
*0327 66C *0327 20B *0327 20C *0425 60C *0425 60B *0425 60M *0425 30C *0425 30B
*0425 80C *0425 80B *0425 61C *0425 61B *0425 61M *0425 11C *0425 11B *0425 15C
*0425 15B *0425 20C *0425 40C *0425 40B *0425 66C *0425 66B *0118 60C *0118 60B
*0118 60M *0118 40B *0118 40C *0118 30C *0118 30B *0118 60B *0118 80C *0118 61C
*0118 61B *0118 20C *0118 66B *0118 66C *0118 11C *0118 15C *0118 90C *0350 60C
*0350 60B *0350 60M *0350 15C *0350 15B *0350 11C *0350 80B *0350 80C *0350 61C
*0350 30C *0350 30B *0350 40C *0350 40B *0350 66C *2727 80B *2727 60B *2727 60M
*2727 70B *2727 30B *2727 40B *2727 40C *2727 40M *2727 66B *2727 61B *2727 15B
*2727 11B *1817 70B *1817 60B *1817 80C *1817 60C *1817 60B *1817 40B *1817 40C
*1817 66B *1817 30B *1817 30C *1817 61C *1817 61B *1817 20B *1817 20C *1817 11B
*1817 15C *0119 60C *0119 60B *0119 60M *0119 30C *0119 30B *0119 40B *0119 40C
*0119 80B *0119 80C *0119 61C *0119 61B *0119 66C *0119 66B *0119 20C *0119 11C
*0119 11B *0119 15C *0119 15B *0119 90C *0114 60C *0114 60B *0114 60M *0114 80B
*0114 80C *0114 30B *0114 30C *0114 30M *0114 61C *0114 61B *0114 11C *0114 11B
*0114 40B *0114 40C *0114 66B *0114 66C *0114 15C *0114 90C *0156 60C *0156 60B
*0156 60M *0156 30C *0156 30B *0156 80B *0156 80C *0156 61C *0156 61B *0156 40B
*0156 40C *0156 66B *0156 66C *0156 11C *0156 11B *0156 15C *0156 20C *0156 90C
*0120 60C *0120 60B *0120 60M *0120 80B *0120 30C *0120 80M *0120 30C *0120 30B
*0120 30M *0120 40B *0120 40C *0120 40M *0120 61C *0120 61B *0120 15C *0120 15B
*0120 11C *0120 11B *0120 66B *0120 66C *0120 20C *0120 90C *0352 60C *0352 60B
*0352 60M *0352 80B *0352 80C *0352 61C *0352 15C *0352 40B *0352 40C *0352 11C
*0352 66B *0352 66C *0352 30C *0352 30B *0352 90B *0451 60C *0451 60B *0451 30C
*0451 30B *0451 80B *0451 60C *0451 15C *0451 11C *0451 61C *0451 61B *0451 20C
*0451 40B *0451 66C *2703 30B *2703 30M *2703 30C *2703 61B *2703 61C *2703 60B
*2703 60C *2703 60M *2703 80B *2703 80C *2703 40B *2703 40M *2703 66B *0356 60C
*0356 60B *0356 30C *0356 30B *0356 11C *0356 15C *0356 61C *0356 61B *0356 80B
*0356 80C *0356 40C *0356 40B *0356 90B *0332 60C *0332 60B *0332 60M *0332 80B
*0332 80C *0332 11C *0332 61C *0332 61B *0332 40B *0332 40C *0332 15C *0332 30C
*0332 30B *0332 20C *0332 90C *0332 66C *0317 80B *0317 80C *0317 60C *0317 60B
*0317 60M *0317 30C *0317 30B *0317 61B *0317 61C *0317 11C *0317 15C *0317 40C
*0317 40B *0328 60C *0328 60B *0328 15C *0328 80B *0328 80C *0328 11C *0328 61C
*0328 61B *0328 20C *0328 66B *0328 40C *0328 40B *0328 30C *1718 70B *1718 80B
*1718 80C *1718 60C *1718 60B *1718 60M *1718 40B *1718 40C *1718 61B *1718 61C
*1718 30B *1718 30C *1718 15C *1718 66B *1718 11C *5217 60C *5217 60B *5217 30C
*5217 61C *2020 70B *2020 80B *2020 80C *2020 60B *2020 60C *2020 30B *2020 30C
*2020 15C *2020 15B *2020 66B *2020 61B *2020 61C *2020 11C *2020 90B *0127 30C
*0127 30B *0127 60C *0127 60B *0127 60M *0127 80B *0127 80C *0127 40B *0127 40C
*0127 61C *0127 61B *0127 66C *0127 66B *0127 11C *0127 90C *0256 60C *0256 60B
*0256 60M *0256 80B *0256 80C *0256 30B *0256 30C *0256 61B *0256 61C *0256 66B
*0256 66C *0256 15C *0256 15B *0256 11C *0256 11B *0256 40C *0256 40B *0256 20C
*0256 90C *0151 60B *0151 30C *0151 60C *0151 80B *0151 60M *0151 40B *0151 40C
*0151 30B *0151 30C *0151 66B *0151 61B *0151 61C *0151 15B *0151 11B *0151 11C
*0151 20C *0123 80B *0123 80C *0123 60C *0123 60B *0123 15C *0123 15B *0123 40B
*0123 40M *0123 30B *0123 30C *0123 11B *0123 11C *0123 61B *0123 66B *2504 30C
*2504 30B *2504 60C *2504 60B *2504 80C *2504 80B *2504 61C *2504 61B *2504 70B
*2504 66C *2504 20C *2504 40C *2504 15C *5251 60C *5251 60B *5251 40B *5251 80B
*5251 80C *5251 61B *5251 61C *5251 66B *5251 30B *5251 30C *5251 11B *0329 60C
*0329 60B *0329 30B *0329 30C *0329 15C *0329 80B *0329 80C *0329 61C *0329 11C
*0329 40C *0329 40B *0251 80B *0251 60B *0251 60M *0251 60C *0251 30B *0251 66B
*0251 40B *0251 61B *5103 60B *5103 60C *5103 60M *5103 80B *5103 80C *5103 30C
*5103 30B *5103 30M *5103 40B *5103 40M *5103 40C *5103 61B *5103 61C *5103 66B
*5103 66C *2001 80B *2001 90M *2001 80C *2001 30C *2001 30B *2001 30M *2001 61C
*2001 61B *2001 60B *2001 60C *2001 60M *2001 40B *2001 40M *2001 66B *2001 66C
*2001 15B *2001 70B *5051 40B *5051 60B *5051 60M *5051 60C *5051 61B *5051 61C
*5051 80B *5051 30B *5051 66B *5051 20B *0218 60C *0218 60B *0218 60M *0218 80B
*0218 80C *0218 30C *0218 30B *0218 66B *0218 61C *0218 61B *0218 40B *0218 40C
*4601 66B *4601 66C *4601 60B *4601 60M *4601 60C *4601 30B *4601 30C *4601 30M
*4601 80B *4601 90C *4601 61B *4601 61C *1401 66C *1401 66B *1401 30B *1401 30C
*1401 60B *1401 60C *1401 60M *1401 80B *1401 80C *1401 61C *1401 61B *1401 40B
*1401 20C *1401 90C *1401 11C *5601 30C *5601 30B *5601 60C *5601 60B *5601 61C
*5601 61B *5601 80B *5601 80C *5601 20B *5601 40B *1720 80B *1720 30M *1720 60C
*1720 60B *1720 60M *1720 15C *1720 15B *1720 30B *1720 30C *1720 61B *1720 61C
*1720 11C *1720 11B *1720 40B *1720 40M *1901 30C *1901 30B *1901 30M *1901 61C
*1901 61B *1901 60C *1901 60B *1901 60M *1901 80B *1901 80C *1901 40B *1901 66B
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Figure F-1. Route-commodity-mode Combinations (page 1 of 4 pages)

*1901	66M	*1901	20C	*2701	303	*2701	30C	*2701	30M	*2701	803	*2701	60B	*2701	60C
*2701	60M	*2701	404	*2701	403	*2701	61B	*0427	60C	*0427	60B	*0427	60M	*0427	306
*0427	30C	*0427	61C	*0427	303	*0427	80C	*0427	11C	*0427	66M	*0427	66C	*0427	15C
*5203	61C	*5203	613	*5203	61M	*5203	606	*5203	60C	*5203	60M	*5203	408	*5203	803
*5203	80C	*5203	30C	*5203	303	*5203	30M	*5203	663	*5203	11M	*5203	11B	*1002	80C
*1002	668	*1002	608	*1002	303	*1002	20B	*0301	908	*0301	30B	*0301	30C	*0301	608
*0301	60C	*0301	604	*0301	613	*0301	20B	*0301	408	*0146	603	*0146	60C	*0146	60M
*0146	506	*0146	60C	*0146	303	*0146	30C	*0145	116	*0146	11C	*0146	15B	*0146	663
*0146	40B	*0146	613	*0146	203	*0211	60C	*0211	608	*0211	606	*0211	30B	*0211	613
*0211	61C	*0211	118	*0211	11C	*0211	15B	*0211	40C	*0211	409	*0211	20C	*0103	80B
*0103	30C	*0103	303	*0103	903	*0103	668	*0103	408	*0103	40C	*0103	608	*0103	618
*0227	803	*0227	303	*0227	304	*0227	606	*0227	60M	*0227	668	*0227	613	*0214	60C
*0214	608	*0214	30C	*0214	303	*0214	80C	*0214	908	*0214	61C	*0214	618	*0214	66C
*0214	40C	*0214	403	*1801	60C	*1801	606	*1801	60M	*1801	608	*1801	80C	*1801	40B
*1801	40C	*1801	30C	*1801	303	*1301	61C	*1801	618	*1801	61M	*1801	668	*0452	60C
*0452	603	*0452	603	*0452	803	*0452	61C	*0452	11C	*0452	66C	*0452	30C	*0452	303
*0452	15C	*0452	403	*0450	60C	*0450	60B	*0450	15C	*0450	11C	*0450	808	*0450	80C
*0450	30C	*0450	303	*0450	61C	*0450	406	*0210	808	*0210	608	*0210	60C	*0210	668
*0210	308	*0210	30C	*0210	113	*0210	408	*0456	60C	*0456	606	*0456	30C	*0456	306
*5602	61C	*5602	619	*5602	303	*5602	30C	*5602	808	*5602	60C	*5602	608	*5602	60C
*5602	663	*0115	303	*0115	60C	*0115	606	*0115	60C	*0115	303	*0115	30C	*0115	666
*0115	66C	*0115	403	*0115	613	*0115	20B	*0115	158	*1417	60C	*1417	80B	*1417	30C
*5101	309	*5101	30C	*5101	304	*5101	608	*5101	606	*5101	604	*5101	60C	*5101	616
*5101	61C	*5101	403	*5101	40M	*5101	666	*5101	66M	*1301	608	*1301	608	*1301	662
*1301	303	*1301	613	*5102	603	*5102	605	*5102	60M	*5102	309	*5102	30C	*5102	30M
*5102	668	*5102	66M	*5102	613	*5102	61C	*5102	406	*0203	803	*0203	608	*0203	305
*0203	408	*0102	606	*0102	603	*0102	306	*0102	668	*0102	616	*0102	118	*0102	403
*5232	60C	*5232	606	*5232	60M	*5232	806	*5232	408	*5232	61C	*5232	618	*5232	308
*5232	30C	*5152	60C	*5152	603	*5152	60M	*5152	618	*5152	61C	*5152	808	*5152	308
*5152	30C	*5152	403	*5152	563	*5152	206	*1703	808	*1703	303	*1703	30C	*1703	603
*1703	60C	*1703	60M	*2803	61C	*2803	618	*2803	60C	*2803	608	*2803	808	*2803	80C
*2803	90C	*2803	40C	*2803	11C	*0220	606	*0220	80C	*0220	608	*0220	60C	*0220	60M
*0220	30C	*0220	308	*0220	668	*0220	61C	*0220	616	*0220	408	*0223	608	*0223	60C
*0223	803	*0223	303	*0223	30C	*0223	408	*0223	618	*0223	668	*0223	66C	*0249	803
*0249	608	*0249	613	*0249	403	*0121	808	*0121	80C	*0121	508	*0121	50C	*0121	303
*0121	40C	*0121	403	*0121	613	*0121	118	*1102	308	*1102	30C	*1102	618	*1102	803
*1102	603	*1102	60C	*1102	60M	*1102	666	*1102	116	*1102	408	*1102	208	*1102	158
*1502	808	*1502	608	*1502	663	*1502	308	*1502	406	*1501	608	*1501	608	*1501	668
*1501	308	*1501	403	*5233	803	*5233	80C	*5233	608	*5233	60C	*5233	61C	*5233	618
*5233	30C	*5233	303	*0219	603	*0219	60C	*0219	60C	*0219	608	*0219	30C	*0219	308
*0219	61C	*0219	616	*0219	403	*0219	40C	*0219	66C	*5250	603	*5250	60C	*5250	60M
*5250	808	*5250	613	*5250	61C	*5250	606	*5250	408	*5250	308	*5250	15B	*5052	605
*5052	60M	*5052	60C	*5052	803	*5052	618	*5052	61C	*5052	308	*5052	30C	*5052	406
*1902	803	*1902	604	*1902	30C	*1902	306	*1902	616	*1902	61C	*1902	60C	*1902	608
*0113	803	*0113	605	*0113	613	*0113	61C	*0113	306	*0113	30C	*0113	668	*0113	408
*0113	158	*0215	603	*0215	603	*0215	60C	*0215	306	*0215	30C	*0215	668	*0215	61C
*0215	408	*5003	603	*5003	60C	*5003	60M	*5003	61C	*5003	618	*5003	30C	*5003	306
*5003	304	*5003	608	*5003	80C	*5003	668	*5003	408	*1751	408	*1751	608	*1751	60C
*1751	30C	*0101	303	*0101	603	*0101	608	*0101	618	*2704	306	*2704	668	*2704	803
*2704	603	*2704	908	*1004	803	*1004	608	*1004	666	*1402	30C	*1402	308	*1402	60C
*1402	608	*1402	808	*1402	80C	*1402	61C	*1402	613	*1402	66C	*1402	11C	*0417	808
*0417	603	*0417	903	*0417	303	*0417	30C	*0417	618	*0417	403	*5603	30C	*5603	303
*5603	60C	*5603	603	*5603	61C	*5603	618	*5603	803	*5603	80C	*5603	20C	*0129	60C
*0129	608	*0129	606	*0129	80C	*0129	30C	*0129	303	*0129	61C	*1652	408	*1652	60C
*1003	808	*1003	608	*1003	663	*0410	806	*0410	606	*0410	303	*1101	308	*1101	306
*1101	616	*1101	403	*0432	60C	*0432	606	*0432	11C	*0432	30C	*0432	61C	*0432	15C
*0432	80C	*0432	803	*0432	403	*0152	60C	*0152	608	*0152	604	*0152	303	*0152	408
*0152	308	*0152	30C	*1152	61C	*0152	618	*0152	11C	*0310	308	*0310	80C	*0310	403
*0310	603	*0310	60C	*0310	303	*5229	606	*5229	60C	*5229	60M	*5229	668	*5229	616
*5229	61C	*5229	803	*5229	303	*5229	158	*5127	80B	*5127	608	*5127	60C	*5127	60M
*5127	308	*5127	30C	*5127	30M	*5127	663	*5127	618	*5127	408	*0132	908	*0132	608
*0132	60M	*0132	303	*0132	403	*0302	908	*0302	80M	*0302	308	*0302	603	*0302	60M
*0302	613	*0302	408	*2751	403	*2751	40C	*2751	808	*2751	80C	*2751	608	*2751	60C
*2751	60M	*2751	308	*2751	30C	*2751	618	*2751	666	*2751	113	*0330	60C	*0330	603
*0330	403	*0330	603	*0330	60C	*0330	30C	*0330	308	*0330	61C	*0330	11C	*0314	806
*0314	60M	*0314	60C	*0314	603	*0314	308	*0314	613	*0314	408	*5227	308	*5227	60C
*5227	603	*5227	613	*5227	61C	*5227	306	*5227	408	*0111	60C	*0111	608	*0111	60M
*0111	668	*0111	613	*0111	803	*0111	80C	*0111	308	*0111	113	*0111	11C	*0111	159
*0111	40C	*0111	403	*5201	60C	*5201	606	*5201	30C	*5201	308	*5201	805	*5201	61C
*5201	61C	*5201	403	*3250	60C	*3250	608	*3250	11C	*3250	61C	*3250	613	*3250	808
*3251	60C	*3251	603	*3251	603	*3251	61C	*3251	613	*3251	30C	*3251	308	*3251	403
*2002	806	*2002	30C	*2002	303	*2002	61C	*2002	613	*2728	60C	*2728	608	*2728	60M
*2728	616	*2728	60C	*2726	604	*2728	61C	*2728	613	*2728	20C	*2728	40C	*2728	408
*2728	65C	*3203	60C	*3203	603	*3203	61C	*3203	616	*3203	408	*3203	40C	*3203	668
*3203	30C	*3203	303	*3203	11C	*2702	208	*2702	603	*2702	308	*2702	304	*2702	406
*5132	806	*5132	603	*5132	60C	*5132	60M	*5132	616	*5132	61C	*5132	303	*5132	30C
*5132	11C	*5132	403	*2903	30C	*2903	308	*2903	30M	*2903	668	*2903	61C	*2903	616
*2903	606	*2903	60C	*2903	303	*2903	409	*0349	503	*0349	30C	*0349	60C	*0349	608
*0349	403	*0349	61C	*0349	613	*0349	30C	*0349	306	*0349	20C	*0333	61C	*0333	616
*0333	60C	*0333	603	*0333	30C	*0333	303	*0333	60C	*0333	803	*0333	413	*0333	40C
*1717	306	*1717	30C	*1717	307	*1717	606	*1717	604	*1717	60C	*1717	618	*1717	61C
*1717	66M	*3003	61C	*3003	[illegible]	*3003	60C	*3003	608	*3003	30C	*3003	308	*3003	[illegible]

Figure F-1. Route-commodity-mode Combinations (page 2 of 4 pages)

*3003	90C	*5252	903	*5252	503	*5252	408	*5252	603	*0252	308	*0252	50C
*0252	660	*0252	303	*0108	503	*0103	504	*0108	60C	*0108	803	*0108	403	*0108	155
*0108	113	*1723	50C	*1723	50	*1723	308	*1723	303	*1723	15C	*1723	613
*0201	503	*0201	604	*0201	503	*0201	613	*0201	61C	*0201	303	*1917	303
*1917	60C	*1917	30C	*1917	303	*1917	61C	*1917	613	*1051	406	*0415	303
*5104	30C	*5104	303	*5104	304	*5104	518	*5104	61C	*5104	504	*5104	50C
*5104	303	*5104	15C	*5104	11C	*5104	405	*0232	308	*0232	503	*0232	303
*1719	40M	*1719	50C	*1719	503	*1719	30C	*1719	808	*1719	30C	*1719	303
*3052	60C	*3052	603	*3052	50C	*3052	308	*3052	668	*3052	618	*3052	61C
*5204	303	*5204	51C	*5204	513	*5204	30C	*5204	303	*5204	508	*5204	50C
*5732	80C	*5732	51C	*2729	80	*2729	80C	*2729	603	*2729	60C	*2729	604
*2729	30C	*2729	403	*2729	51	*1708	508	*0144	408	*0144	808	*0144	303
*0144	503	*0144	613	*1504	503	*1504	613	*1504	668	*1504	603	*3252	60C
*3252	604	*3252	653	*3252	51C	*3252	516	*3252	408	*3252	30C	*0304	303
*0304	610	*0304	603	*5150	60C	*5150	60C	*5150	60M	*5150	568	*5150	613
*5150	303	*5150	30C	*5150	30C	*5150	11C	*5150	158	*5320	508	*5001	303
*5001	30M	*5001	603	*5001	504	*5001	808	*5001	613	*5001	408	*1725	30C
*0250	803	*0250	603	*0250	303	*0250	518	*0250	408	*1413	50C	*1413	603
*1413	61C	*1413	513	*1413	303	*0150	903	*0150	608	*0150	303	*0150	513
*2927	605	*2927	60C	*2927	50K	*2927	808	*2927	308	*2927	30C	*2927	613
*2927	153	*2927	403	*0323	50C	*0323	508	*0323	303	*0323	80C	*2017	50C
*2017	803	*2017	80C	*2017	30C	*2017	308	*2017	61C	*2017	513	*2017	15C
*2752	803	*2752	403	*2752	603	*2752	50C	*2752	604	*2752	303	*2752	613
*2732	604	*2732	603	*2732	60C	*2732	513	*2732	308	*2732	408	*2732	404
*0221	603	*0221	50C	*1221	303	*1221	518	*1919	608	*1919	60C	*1919	50M
*1919	803	*1919	804	*1919	303	*1919	30C	*1919	61C	*1919	613	*1919	51M
*0107	604	*0107	60C	*0107	803	*0107	208	*0107	408	*0107	113	*3051	50C
*3051	803	*3051	60C	*3051	61C	*3051	30C	*3051	668	*3051	403	*5027	613
*5027	614	*5027	603	*5027	50C	*5027	504	*5027	803	*5027	30C	*5027	308
*5027	663	*5027	403	*0149	503	*0149	508	*0149	60C	*0149	403	*0149	303
*1802	603	*1802	60C	*1802	604	*1802	30C	*1802	308	*1802	61C	*1802	803
*1820	803	*1820	603	*1820	60C	*1820	408	*1820	30C	*1820	61C	*0428	60C
*0437	80C	*0437	803	*0437	61C	*0437	30C	*1313	308	*1313	608	*1313	663
*1313	613	*1920	503	*1920	50C	*1920	90C	*1920	803	*1920	403	*1920	703
*1920	303	*1920	61C	*1920	613	*5614	908	*5614	30C	*5614	503	*5614	618
*5614	603	*5614	60C	*2951	603	*2951	308	*2951	30C	*2951	513	*2951	61C
*2951	903	*2951	403	*2901	50C	*2901	308	*2901	61C	*2901	613	*2901	303
*2901	60C	*2734	803	*2734	503	*2734	303	*3503	808	*0315	308	*0315	603
*0145	408	*0145	303	*0145	603	*0145	308	*0145	613	*0303	803	*0303	308
*3201	653	*3201	61C	*3201	503	*3201	60C	*3201	30C	*3201	503	*2301	303
*2301	303	*2301	30C	*2301	603	*2301	60C	*0222	803	*0222	608	*0222	303
*0244	503	*0244	50C	*0244	303	*0122	803	*0122	603	*0122	50C	*0122	303
*0116	803	*0116	61C	*0116	513	*0116	903	*0116	30C	*0116	308	*0116	603
*0116	15C	*5230	50C	*5230	603	*5230	908	*5230	303	*5230	30C	*1456	903
*1456	608	*1456	303	*1456	613	*0104	908	*1714	808	*1714	508	*5202	303
*5202	60C	*5202	613	*5202	603	*5202	408	*3072	60C	*3032	603	*3032	803
*5117	30C	*5117	303	*5117	613	*0110	608	*0110	808	*0110	503	*0110	30C
*0110	408	*3427	803	*1721	603	*1721	808	*1721	308	*3629	608	*0130	603
*0130	308	*0130	30C	*0130	803	*0130	618	*0130	408	*3429	50C	*3429	603
*3429	11C	*3429	513	*3403	803	*3403	308	*3403	608	*3403	613	*2713	303
*2902	668	*2902	303	*5256	803	*5256	60C	*5256	608	*5256	613	*5256	303
*2019	30C	*2019	563	*2019	60C	*2019	508	*2019	30C	*2019	308	*2019	61C
*2019	908	*0109	60C	*0109	503	*0109	51C	*0109	613	*0109	308	*0109	30C
*0109	30C	*0109	15C	*0109	11C	*0109	403	*5032	803	*5032	503	*5032	60C
*5032	61C	*5032	303	*5032	30C	*3803	508	*3803	60C	*3803	568	*3803	61C
*1314	618	*1314	61C	*1314	60	*1314	308	*0124	808	*0124	308	*0124	603
*0124	118	*0124	40	*5645	30	*5645	303	*5645	608	*2801	608	*5002	308
*5002	608	*5002	663	*5002	613	*0133	906	*0133	603	*0133	61C	*0133	513
*0133	30C	*0133	403	*2302	603	*2302	608	*2302	668	*2302	303	*1755	303
*1756	30C	*0318	50C	*0318	60	*0318	803	*0318	30C	*3227	518	*3227	51C
*3227	603	*3227	60C	*3227	60	*3227	30C	*3227	308	*3227	403	*3227	208
*3050	603	*3050	803	*3050	50C	*3050	518	*3050	303	*3001	518	*3001	308
*3001	603	*1921	603	*1921	803	*2738	908	*2738	80C	*2738	603	*2738	60C
*2738	40C	*2733	403	*2738	20	*2738	51C	*0333	60C	*0333	604	*0338	503
*0333	803	*0338	40C	*3257	303	*3257	50C	*3257	603	*0339	308	*0339	303
*0339	613	*0339	403	*5317	803	*1115	566	*1115	603	*1115	303	*5004	51C
*5004	308	*5004	30C	*5004	603	*5004	60C	*3017	60C	*3272	50C	*3202	603
*3202	61C	*3202	513	*3202	303	*3202	30C	*0449	803	*0449	30C	*0449	60C
*3229	60M	*3229	603	*3229	903	*3229	309	*3229	803	*1903	508	*1903	303
*1403	50C	*1403	50C	*1403	503	*1403	30C	*1403	303	*1403	61C	*3352	503
*3519	504	*3517	803	*1001	503	*1001	908	*1650	60C	*2317	50C	*2317	15C
*2750	604	*2750	60C	*2750	51	*2750	51C	*2750	708	*2750	608	*2750	403
*2750	308	*1704	30C	*1704	30	*1316	503	*1318	60C	*1313	30C	*0213	503
*0213	303	*1450	50C	*1903	50C	*1303	61C	*1603	30C	*1603	303	*5149	303
*2627	508	*2027	50C	*2327	604	*2527	903	*2027	80C	*2827	668	*2827	408
*1749	303	*1749	603	*1201	60	*1201	60C	*1201	308	*1201	30C	*1201	61C
*2932	618	*2932	303	*2932	30C	*2732	803	*2972	113	*3027	503	*3327	50C
*3027	808	*3027	60C	*2974	30C	*2904	306	*2974	61C	*2904	613	*2974	503
*3004	618	*3004	30C	*3004	303	*0229	30	*0229	308	*0229	503	*0229	513
*5030	618	*5030	603	*0170	60	*3832	503	*5129	603	*5129	504	*5129	303
*5129	303	*1727	30C	*1727	30	*1727	50C	*0273	603	*0233	303	*0233	513
*5249	908	*5249	50C	*5249	50	*5249	30C	*0403	903	*0403	308	*0403	303

Figure F-1. Route-commodity-mode Combinations
(page 3 of 4 pages)

*0426	30C	*0426	60C	*0426	61C	*5610	60B	*5610	80B	*5610	30B	*0340	80C	*0340	80B
*0340	60C	*1746	60M	*1746	60B	*1746	30B	*0134	30B	*0134	30C	*0134	61C	*0134	61B
*0134	60B	*0901	61C	*0901	61B	*0901	80B	*0901	60B	*0901	30C	*0901	20C	*5703	66B
*0230	60B	*0230	80B	*0230	30B	*0433	60C	*0433	30C	*0433	61C	*0245	80B	*0245	30B
*0245	60B	*0245	61B	*0334	30B	*0334	61B	*0334	40B	*0334	60B	*0334	60C	*0001	60B
*0001	30B	*2950	60B	*2950	61B	*2950	80B	*2950	30B	*2950	66B	*2950	40B	*1724	80B
*1724	60B	*1724	30B	*1724	30C	*5029	61B	*5029	60B	*5029	30B	*5029	80B	*3303	60C
*3303	66C	*5056	80B	*5056	61B	*1619	60C	*1619	60B	*1819	40B	*1619	40C	*1819	80C
*4029	60B	*4029	60B	*0344	30B	*0344	80B	*0344	60B	*0112	61C	*0112	80B	*0112	60C
*0112	30C	*0112	15C	*0112	11C	*1918	40B	*1918	60C	*1918	60B	*1918	61C	*1918	30C
*1601	60C	*1601	61C	*1601	80B	*1601	30C	*0501	66M	*0501	60B	*0501	60M	*2952	60B
*2952	60C	*2952	61B	*2952	90B	*2952	30B	*2952	40B	*5133	61C	*5133	61B	*0224	80B
*0224	30B	*0224	60B	*5033	60B	*5033	30C	*5033	80B	*1114	30B	*1114	80B	*2940	60B
*2940	80B	*2940	61B	*3401	30B	*3401	61B	*1951	60C	*2739	30B	*2739	80B	*2739	60B
*2739	40B	*1621	60B	*2320	80B	*3204	30C	*3204	30B	*3204	61C	*3204	60B	*3204	60C
*3204	80C	*3217	60C	*3217	61C	*2929	30B	*2929	60B	*2929	80B	*2929	61B	*0430	60C
*0430	30C	*0154	60B	*3350	60C	*5130	60C	*5170	60B	*0319	30C	*0319	30B	*0319	80B
*0319	61B	*1752	60C	*3002	80B	*3002	30B	*3002	60B	*3002	61B	*2829	60M	*0708	60B
*1922	30B	*1922	30C	*1922	80B	*5617	80C	*3233	60C	*3233	60B	*2431	60B	*2431	30B
*0801	60M	*0801	60B	*1415	61C	*1415	60B	*2928	61C	*2628	61B	*2828	80B	*3374	66C
*5615	60C	*5615	30B	*2402	80B	*2402	30B	*2402	60B	*1015	80B	*2749	80B	*2018	61B
*2018	60B	*2018	30B	*5644	30B	*5644	80B	*0324	60B	*0324	30C	*0324	30B	*3351	60C
*3027	60C	*3027	60B	*3027	61C	*3027	61B	*3027	30B	*4402	61B	*4402	30B	*0439	30B
*0257	60B	*4501	30B	*1709	61B	*1709	30B	*1709	80B	*1709	60B	*2314	60C	*3143	30C
*0143	30B	*3029	60C	*1823	30B	*1823	60B	*0401	30B	*1722	80B	*1722	30B	*1722	60B
*0357	80B	*0357	60C	*0357	60B	*0357	60M	*1949	80B	*0234	30B	*0234	30C	*0234	60B
*4952	60C	*4952	60B	*2323	60C	*0917	61B	*2004	61C	*2004	30C	*0322	60B	*0322	80B
*0322	61B	*1924	30B	*1930	60C	*0204	80B	*2024	61C	*2024	30C	*1302	30B	*0402	30B
*2051	61B	*1923	60C	*1923	30C	*0320	60B	*0320	30B	*0320	61B	*3834	60B	*1317	60C
*0444	30B	*0444	60B	*0345	30B	*0345	60B	*3704	30C	*3704	60C	*3903	80B	*3903	30B
*1734	61B	*1734	30B	*1419	30B	*0313	30B	*0434	30B	*4502	30B	*1700	60B	*2003	30B
*2003	30C	*3352	60C	*1918	61B	*2101	30C	*4456	30B	*5224	30B	*5214	60C	*1315	80B
*1556	30B	*2604	61B	*2604	61C	*2604	60C	*1750	30C	*1750	30B	*5125	61B	*3402	30B
*3249	61C	*3249	60B	*1900	60B	*0105	61B	*0105	60C	*0105	60M	*4504	30B	*1729	30C
*1304	30C	*1604	61B	*4401	30B	*0414	30B	*2049	61C	*2303	30B	*1145	30B	*3828	60M
*3628	60B	*3033	30B	*2021	30B	*1733	61B	*0701	60B	*5234	30B	*5234	60B	*1745	30B
*4901	30B	*2717	30B	*3404	30B	*1946	30B	*4904	30B	*1730	30B	*1110	30B	*2318	30C
*1713	30B	*2452	30B	*5604	30B	*0438	60B	*2526	60B	*2730	61B	*2928	60B	*0418	30B
*3049	60B	*3224	60B	*3230	60B										

Figure F-1. Route-commodity-mode Combinations (page 4 of 4 pages)

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UNCLASSIFIED*G41WFI(1).ROUTES/OMIT(7)
0117  9
80M 61M 61B 90M 15B 70B 66M 90B 11M
0217 16
30B 40B 61B 90B 50M 22B 40C 11C 66M 80C 20B 66C 90C 61M 40M 30M
1731 13
40M 66M 61M 80M 80C 90C 70B 20B 30M 66C 15C 40C 30B
0351 12
60M 61B 40M 20C 30M 61M 11M 80M 66M 90C 70B 66B
1702 14
90B 61C 66M 65B 50C 70B 61M 90C 90M 40M 40B 30M 66C 11B
0327  8
40B 60M 20B 61B 40M 11C 20C 66B
0425 12
11B 15B 30B 60B 61B 66B 80B 66C 40B 60M 61M 20C
0118 10
40B 11C 40C 60B 15C 90B 90C 30B 66B 50M
0350  7
60M 40B 80C 40C 30B 15B 66C
2727  7
15B 70B 66B 40C 11B 40M 60M
1817 10
61C 80C 30B 66B 40B 30C 40C 20C 20B 11B
0119 10
61B 15C 11C 80C 40B 11B 20C 90C 15B 66B
0114 10
11B 61B 30M 60M 40B 11C 66C 66B 90C 15C
0156 12
11B 30B 60B 61B 40B 11C 60M 40C 15C 20C 90C 66B
0120 14
40B 66B 30B 61B 40C 11B 60M 66C 30M 40M 15C 15B 80M 90C
0352  7
30B 60M 80C 30C 66B 66C 90B
0451 10
80B 11C 15C 61C 30B 61B 66C 90C 20C 40B
2703  7
60C 30M 66B 60M 40M 80C 30C
0356  8
30B 60B 61B 80B 80C 40C 90B 40B
0332 10
20C 80B 80C 60M 30B 61B 40C 55C 40B 90C
0317 10
80C 60M 30B 60B 61B 80B 40B 11C 40C 61C
0328  4
61B 40B 66B 30C
1718 10
30B 60B 61C 11C 15C 30C 40B 40C 60M 66B
5217  4
60B 30C 60C 61C
2020 10
60C 80C 61B 11C 15C 66B 15B 51C 30C 90B
0127 10
40B 61C 66C 80C 60M 11C 40C 55B 90C 61B
0256 14
60M 30C 40B 11B 61C 11C 15B 40C 20C 66C 80C 90C 15C 66B
0151 13
30B 40B 11B 61B 60M 55B 15B 90C 11C 40C 61C 30C 20C
0123  9
40B 11B 66B 80B 15B 51B 80C 30C 40M
2504  8
60B 80B 61C 61B 70B 20C 40C 15C
```

Figure F-2. Manually Excluded Routes

```
UNCLASSIFIED*G4TWFI(1).ROUTES/INCLUDE(0)
5251  2
60C 60B
0329  5
60C 30B 15C 61C 11C
0251  2
80B 60B
5103  6
60B 60C 80B 30C 30B 61B
7001  2
30C 61C
5051  1
60B
0218  3
60C 60B 80B
4601  1
60B
1401  3
66C 30B 60C
5601  2
30C 61C
1901  3
70C 61C 60C
2701  1
30B
0427  4
60C 60B 30B 61C
5200  3
61C 61B 30C
0301  1
30B
0146  1
60C
0103  1
30C
0214  3
30C 61C 60C
1801  2
30B 61C
0452  2
60C 60B
0450  2
60C 60B
0456  2
60C 30C
5602  1
61C
0115  1
30B
5101  2
30B 60B
1301  1
60B
2803  2
61C 60C
0223  1
60B
1402  1
30C
5603  2
30C 61C
0129  2
60C 30C
0432  1
60C
0152  1
60C
2751  2
60B 30B
1723  1
60C
5104  1
30C
```

Figure F-3. Manually Included Routes

1	*0117 60C	16799.34	*0117 60B	935.21
2	64682.31		2130.81	
3	58764.47		2181.05	
4	58245.49		1950.59	
5	55269.65		1602.93	
6	58187.63		1334.60	
7	72083.42		2175.89	
8	73891.00		1252.52	
9	81612.55		1627.81	
10	79541.26		1714.13	
11	81764.75		2032.13	
12	93800.09		876.02	
13	91377.82		2588.65	
14	*0117 60H	315.37	*0117 226	10972.15
15	.00		14757.39	
16	99.54		12913.08	
17	76.17		2658.56	
18	17.25		3562.02	
19	49.85		5170.09	
20	.00		10131.44	
21	64.97		8962.49	
22	9.09		7403.62	
23	272.17		15632.15	
24	291.00		7077.55	
25	1[illegible]1.89		14588.19	
26	95.69		7200.82	
27	*0117 806	9790.33	*0117 80C	1250.57
28	16386.60		1616.11	
29	21526.78		654.95	
30	18165.79		573.90	
31	13927.70		451.96	
32	9554.37		393.69	
33	15645.10		399.27	
34	16351.51		247.27	
35	23944.77		567.85	
36	16981.14		527.21	
37	18683.02		276.50	
38	12862.37		1619.85	
39	248[illegible]6.17		785.00	
40	*0117 206	13717.53	*0117 20C	164.77
41	13129.19		.00	
42	9200.49		.00	
43	14919.73		.00	
44	.00		.00	
45	9761.50		.00	
46	10741.15		.00	
47	.00		.00	
48	9590.38		.00	
49	4032.12		.00	
50	10911.21		.00	
51	5706.64		.00	
52	6407.87		.00	
53	*0117 30C	2768.81	*0117 30B	6102.31
54	9508.15		.00	
55	6370.45		772.54	
56	6997.67		1696.38	
57	5898.97		.00	
58	6668.95		.00	
59	7975.41		.00	
60	7075.58		.00	
61	6980.33		.00	
62	9743.37		.00	
63	12811.49		.00	
64	19846.52		.00	
65	15457.53		.00	
66	*0117 40B	2775.57	*0117 40H	1662.38
67	.00		2777.11	
68	.00		3388.73	
69	.00		1902.23	
70	.00		2102.92	
71	.00		4290.84	
72	.00		3994.00	
73	.00		5176.99	
74	1553.62		4942.01	
75	392.84		4954.51	
76	5.66		4611.04	
77	77.49		3791.84	
78	.50		4292.44	
79	*0117 40C	91.73	*0117 15C	394.85
80	119.51		1022.70	
81	63.61		970.89	

Figure F-4. Winters Forecasts
(page 1 of 41 pages)

82	110.95		955.50	
83	75.47		1118.47	
84	67.71		703.95	
85	93.05		913.10	
86	96.83		1061.09	
87	79.07		1375.17	
88	119.68		1315.45	
89	119.36		1709.01	
90	105.25		1496.76	
91	114.44		1635.44	
92	*0117 610	187.65	*0117 660	217.95
93	651.20		566.15	
94	398.57		443.59	
95	459.50		208.25	
96	504.11		334.74	
97	465.14		347.07	
98	415.42		543.29	
99	397.77		600.97	
100	413.09		350.79	
101	404.38		395.30	
102	542.36		466.63	
103	633.46		319.69	
104	536.64		570.99	
105	*0117 660	711.73	*0117 110	278.31
106	.00		579.18	
107	.00		347.51	
108	.00		267.43	
109	.00		172.81	
110	.00		24.49	
111	.00		.00	
112	.00		51.26	
113	.00		.00	
114	.00		.00	
115	.00		.00	
116	.00		.00	
117	.00		694.08	
118	*0217 806	8125.84	*0217 600	969.24
119	.00		3766.29	
120	1010.11		2903.10	
121	756.70		2543.47	
122	.00		3632.04	
123	.00		3629.83	
124	86.14		2589.90	
125	2500.55		3363.87	
126	.00		3123.15	
127	.00		3019.15	
128	314.43		3687.00	
129	12503.19		3531.67	
130	1362.30		2919.01	
131	*0217 603	720.72	*0217 300	647.61
132	134.13		1985.79	
133	310.32		1922.33	
134	309.22		1707.24	
135	413.23		1677.46	
136	190.73		1674.64	
137	150.11		1472.46	
138	177.28		1602.43	
139	171.20		1454.19	
140	132.30		1659.77	
141	193.50		2320.89	
142	815.91		2728.50	
143	228.51		2020.04	
144	*0217 610	157.30	*0217 150	223.51
145	201.16		421.51	
146	231.48		372.87	
147	128.65		333.96	
148	206.08		219.79	
149	158.60		547.86	
150	213.66		511.90	
151	273.98		288.34	
152	165.93		170.38	
153	144.25		16.29	
154	324.95		.00	
155	327.57		.00	
156	208.44		.00	
157	*0217 668	.00	*1701 300	1120.05
158	.00		3499.16	
159	23.67		2175.17	
160	.00		1455.31	
161	.00		1648.35	
162	135.00		2012.99	
163	.00		1763.98	

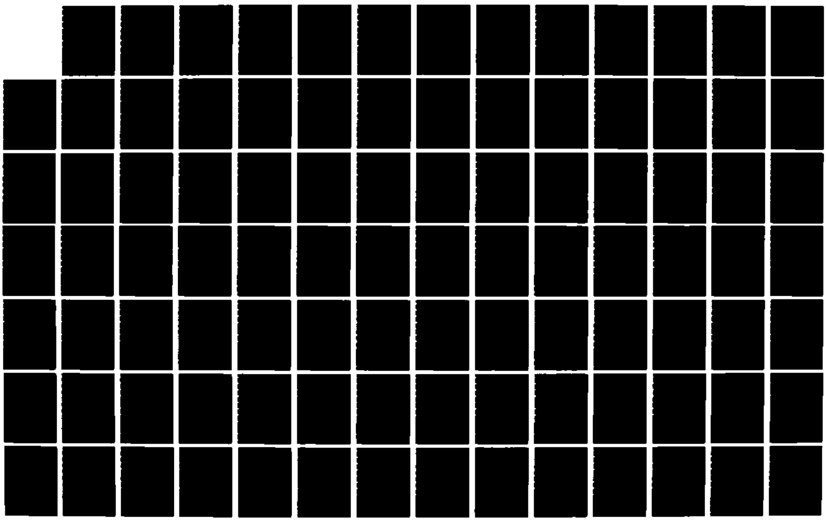
Figure F-4. Winters Forecasts
(page 2 of 41 pages)

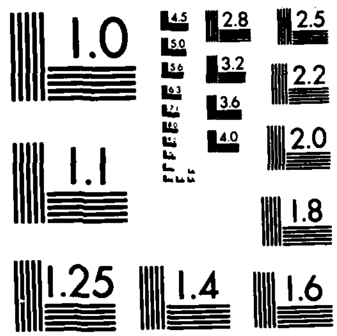
164	.00		1931.43	
165	.00		4551.31	
166	.00		3653.50	
167	.00		3698.38	
168	.00		3067.13	
169	.00		3594.83	
170	*1701 618	758.26	*1701 61C	360.32
171	1100.20		629.26	
172	861.23		709.06	
173	1528.34		335.79	
174	729.72		375.99	
175	843.90		460.81	
176	2055.64		476.27	
177	803.46		301.87	
178	1254.39		435.65	
179	1886.80		592.88	
180	1864.70		616.73	
181	1854.13		620.57	
182	1597.19		550.57	
183	*1701 660	3638.54	*1701 60M	736.91
184	3150.31		540.08	
185	3007.10		1935.77	
186	4228.14		767.07	
187	4612.97		399.58	
188	1342.73		649.73	
189	4351.40		550.57	
190	4626.69		637.27	
191	8872.93		556.29	
192	6248.66		1028.79	
193	2893.64		983.35	
194	4319.63		1536.53	
195	7483.74		1192.01	
196	*1701 608	264.49	*1701 60C	236.05
197	446.39		.00	
198	464.56		.00	
199	198.31		.00	
200	242.05		.00	
201	148.90		.00	
202	252.94		.00	
203	210.68		.00	
204	279.75		.00	
205	244.60		.00	
206	247.65		.00	
207	310.53		.00	
208	409.05		.00	
209	*1701 808	4304.69	*1701 408	2279.33
210	3464.15		.00	
211	.00		.00	
212	.00		.00	
213	.00		.00	
214	.00		.00	
215	.00		.00	
216	.00		.00	
217	.00		.00	
218	.00		.00	
219	.00		.00	
220	.00		.00	
221	.00		.00	
222	*0351 60C	5174.16	*0351 600	652.15
223	9915.63		267.85	
224	11672.38		.00	
225	12577.83		.00	
226	10144.14		.00	
227	10555.81		.00	
228	11469.61		.00	
229	10610.38		.00	
230	10374.18		.00	
231	10210.22		.00	
232	9195.70		28.05	
233	10193.57		300.46	
234	8906.00		293.41	
235	*0351 406	5711.36	*0351 40C	20.58
236	714.62		.00	
237	124.69		1.22	
238	.00		3.23	
239	.00		.00	
240	.00		.00	
241	.00		18.98	
242	.00		7.95	
243	.00		8.71	
244	.00		.00	
245	.00		.00	

Figure F-4. Winters Forecasts (page 3 of 41 pages)

AD-A160 430 TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD H D FREAR ET AL AUG 85

UNCLASSIFIED CAA-SR-85-11 F/G 15/5 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

246	.00		.00	
247	.00		.00	
248	*0351 608	1182.98	*0351 80C	178.90
249	47.52		132.45	
250	94.25		82.42	
251	14.55		178.16	
252	.00		234.19	
253	915.78		68.25	
254	.00		22.47	
255	195.27		171.86	
256	.00		93.35	
257	773.74		99.78	
258	347.14		117.05	
259	430.56		234.96	
260	2275.22		231.11	
261	*0351 30C	252.23	*0351 15C	186.75
262	14.00		175.76	
263	.00		159.99	
264	.00		154.26	
265	.00		182.77	
266	.00		171.15	
267	.00		233.92	
268	.00		239.05	
269	16.49		189.12	
270	261.22		181.26	
271	332.96		193.02	
272	231.62		213.95	
273	210.43		127.23	
274	*0351 11C	115.99	*0351 61C	145.49
275	165.69		93.19	
276	149.73		114.34	
277	208.37		89.31	
278	240.41		92.54	
279	263.24		81.58	
280	305.25		95.88	
281	270.40		76.39	
282	239.49		109.95	
283	205.43		196.09	
284	306.90		159.60	
285	211.37		134.03	
286	225.61		124.57	
287	*0351 66C	46.00	*1702 808	2605.67
288	63.60		10113.67	
289	13.55		.00	
290	4.69		698.52	
291	.00		.00	
292	.00		.00	
293	.00		.00	
294	.00		.00	
295	.00		265.70	
296	.00		.00	
297	.00		.00	
298	34.11		526.40	
299	20.38		202.42	
300	*1702 306	731.86	*1702 30C	653.73
301	809.61		591.01	
302	1210.05		653.61	
303	1234.45		663.63	
304	806.48		913.35	
305	624.16		469.09	
306	1292.59		667.83	
307	709.42		601.77	
308	1692.61		469.98	
309	1222.11		440.03	
310	1607.71		197.70	
311	2112.62		491.25	
312	1937.06		519.54	
313	*1702 61B	527.52	*1702 609	1449.68
314	.00		1204.32	
315	.00		.00	
316	.00		.00	
317	.00		.00	
318	.00		.00	
319	.00		.00	
320	.00		.00	
321	.00		.00	
322	.00		.00	
323	.00		.00	
324	.00		.00	
325	.00		.00	
326	*1702 60M	362.09	*0327 60C	853.68
327	296.62		5816.21	

Figure F-4. Winters Forecasts
(page 4 of 41 pages)

328	206.43		5316.54	
329	512.53		5537.17	
330	607.56		4527.74	
331	630.50		5737.11	
332	404.68		7212.49	
333	164.77		7714.28	
334	431.23		7681.22	
335	396.15		7513.83	
336	96.01		7864.34	
337	524.42		8248.67	
338	161.10		7493.63	
339	*0327 608	69.12	*0327 308	339.81
340	44.95		2013.27	
341	47.75		1429.88	
342	8.65		1778.95	
343	69.34		1925.69	
344	9.25		1538.79	
345	72.02		1734.99	
346	92.30		1782.38	
347	86.95		2329.37	
348	42.64		2869.00	
349	85.95		3474.10	
350	24.63		3077.38	
351	78.70		2878.51	
352	*0327 30C	7.16	*0327 61C	36.77
353	7.61		121.18	
354	7.53		117.51	
355	9.70		83.32	
356	7.20		77.40	
357	10.82		92.67	
358	9.67		83.15	
359	2.68		88.22	
360	3.73		60.16	
361	6.30		67.05	
362	4.27		75.94	
363	5.23		118.72	
364	2.09		96.47	
365	*0327 808	500.14	*0327 80C	17.53
366	19.69		.00	
367	15.23		6.06	
368	.00		.00	
369	75.67		8.96	
370	.00		.00	
371	.00		4.74	
372	101.32		4.57	
373	434.59		4.49	
374	536.11		.00	
375	331.15		.00	
376	255.50		.00	
377	393.31		.77	
378	*0327 40C	19.53	*0327 158	34.21
379	.00		91.82	
380	.00		52.02	
381	.00		54.36	
382	.00		40.66	
383	.00		50.57	
384	.00		62.93	
385	.00		67.22	
386	.00		51.02	
387	.00		65.34	
388	.00		62.46	
389	.00		96.05	
390	.00		78.79	
391	*0327 15C	16.09	*0327 118	10.34
392	6.89		17.77	
393	9.13		26.13	
394	27.25		28.50	
395	9.14		40.54	
396	23.33		10.70	
397	20.99		6.27	
398	7.70		5.19	
399	19.50		8.25	
400	7.01		9.58	
401	27.36		18.91	
402	8.34		31.17	
403	59.21		30.16	
404	*0327 66C	5.08	*0425 60C	1721.96
405	2.02		3910.64	
406	.00		3606.89	
407	.00		2593.15	
408	.00		2435.66	
409	.00		2012.10	

Figure F-4. Winters Forecasts
(page 5 of 41 pages)

410	.00		3268.09	
411	.00		3216.66	
412	.00		3172.55	
413	.00		3390.22	
414	.00		3469.44	
415	.82		3948.84	
416	.08		3993.06	
417	*0425 30C	661.28	*0425 80C	217.98
418	.00		184.52	
419	85.20		98.63	
420	.00		193.87	
421	.00		.54	
422	.00		.00	
423	.00		157.86	
424	.00		65.01	
425	.00		127.77	
426	160.00		197.16	
427	.00		.00	
428	.00		168.82	
429	.00		79.31	
430	*0425 61C	126.02	*0425 11C	47.32
431	173.64		5.67	
432	145.49		.76	
433	201.65		.00	
434	155.90		.00	
435	225.42		37.63	
436	198.30		.00	
437	199.59		.00	
438	191.37		33.52	
439	201.19		13.04	
440	256.72		11.54	
441	228.01		42.86	
442	255.67		28.56	
443	*0425 15C	16.97	*0425 40C	1.64
444	23.68		.16	
445	23.69		.17	
446	18.02		1.07	
447	18.56		.47	
448	1.52		1.04	
449	32.68		1.17	
450	24.42		.00	
451	10.42		.00	
452	37.13		.00	
453	34.93		.00	
454	20.34		1.53	
455	35.65		.43	
456	*0118 60C	963.02	*0118 30C	36.26
457	6230.65		38.34	
458	6269.32		12.49	
459	5492.29		10.98	
460	5695.93		34.37	
461	5960.71		12.05	
462	6559.98		30.42	
463	5805.28		58.46	
464	6450.15		73.26	
465	6514.00		138.26	
466	6977.00		113.56	
467	7726.60		102.05	
468	6891.67		47.17	
469	*0118 80C	61.60	*0118 61C	11.18
470	4.60		24.01	
471	.00		6.38	
472	.00		6.54	
473	.00		4.54	
474	.00		11.04	
475	.00		10.91	
476	23.06		13.54	
477	.00		3.64	
478	.00		17.13	
479	.00		16.35	
480	.00		11.28	
481	5.61		6.64	
482	*0118 66C	25.69	*0350 60C	963.17
483	7.15		4090.38	
484	5.58		4454.11	
485	1.34		4577.24	
486	7.76		3561.52	
487	.78		3864.69	
488	4.37		5168.58	
489	.27		5346.31	
490	1.89		4284.62	
491	50.28		4304.01	

Figure F-4. Winters Forecasts
(page 6 of 41 pages)

492	11.02		4724.01	
493	8.11		4625.67	
494	12.56		4732.62	
495	*0350 608	62.25	*0350 15C	53.88
496	19.66		157.94	
497	53.72		133.06	
498	.91		142.82	
499	72.63		145.66	
500	21.65		143.81	
501	19.83		159.93	
502	10.55		195.46	
503	4.00		143.33	
504	65.72		178.13	
505	28.37		173.46	
506	30.64		163.23	
507	19.64		203.98	
508	*0350 11C	33.17	*0350 808	53.27
509	90.26		24.27	
510	71.13		9.94	
511	103.16		62.09	
512	82.33		9.46	
513	91.14		.00	
514	82.03		15.59	
515	102.70		4.24	
516	66.73		.00	
517	77.06		.00	
518	100.54		.00	
519	79.58		63.38	
520	97.28		.00	
521	*0350 61C	75.61	*0350 30C	13.99
522	.00		1.27	
523	.00		.00	
524	.00		1.75	
525	.00		.00	
526	.00		.00	
527	.00		.00	
528	.00		.00	
529	.00		.00	
530	.00		5.63	
531	.00		4.64	
532	.00		.00	
533	.00		.00	
534	*2727 808	6176.63	*2727 608	151.33
535	990.64		363.56	
536	497.18		340.82	
537	109.24		258.71	
538	395.69		211.93	
539	1040.94		326.44	
540	272.93		291.34	
541	2341.54		245.78	
542	2097.35		669.78	
543	1460.68		609.63	
544	3539.46		601.24	
545	7347.67		744.20	
546	1665.64		579.49	
547	*2727 308	30.91	*2727 408	31.88
548	36.61		46.44	
549	38.06		49.94	
550	29.42		25.36	
551	34.53		23.32	
552	27.25		58.37	
553	25.95		24.74	
554	36.76		31.04	
555	22.12		35.02	
556	39.45		28.70	
557	45.56		111.78	
558	49.71		36.19	
559	47.23		62.07	
560	*2727 618	6.58	*1817 708	645.65
561	1.59		4756.91	
562	.00		4514.35	
563	4.08		4203.80	
564	.80		3353.04	
565	1.65		3296.26	
566	.02		4486.05	
567	5.58		3823.33	
568	1.22		4340.45	
569	1.14		4548.67	
570	8.11		4243.45	
571	5.13		4964.36	
572	18.90		4603.72	
573	*1817 808	1144.81	*1817 60C	203.69

Figure F-4. Winters Forecasts (page 7 of 41 pages)

574	.00		124.98	
575	.00		102.75	
576	.00		109.49	
577	.00		159.86	
578	.00		141.33	
579	.00		39.71	
580	.00		44.52	
581	.00		196.66	
582	.00		66.49	
583	.00		439.36	
584	.00		98.66	
585	.00		201.53	
586	*1817 608	743.64	*0119 60C	951.93
587	.00		2658.89	
588	.00		2240.59	
589	.00		1591.23	
590	.00		406.41	
591	.00		.00	
592	.00		.00	
593	.00		.00	
594	.00		.00	
595	.00		442.52	
596	.00		693.64	
597	.00		1697.71	
598	.00		1709.42	
599	*0119 608	229.53	*0119 30C	125.19
600	.00		490.79	
601	.00		393.07	
602	.00		398.32	
603	.00		350.70	
604	.00		352.20	
605	.00		459.68	
606	.00		324.79	
607	.00		639.04	
608	.00		544.12	
609	.00		638.03	
610	.00		654.79	
611	.00		563.71	
612	*0119 308	16.15	*0119 40C	17.65
613	.00		.00	
614	.00		.00	
615	.00		.00	
616	8.51		.00	
617	.00		.00	
618	.96		.00	
619	.00		.00	
620	4.32		.00	
621	.13		.00	
622	14.40		.00	
623	11.22		.00	
624	.00		.00	
625	*0119 808	240.30	*0119 61C	40.28
626	72.41		65.95	
627	72.05		69.59	
628	.00		30.93	
629	.00		30.12	
630	.00		10.53	
631	178.63		18.54	
632	54.55		14.88	
633	95.45		70.94	
634	21.19		69.19	
635	94.29		65.67	
636	123.03		107.25	
637	143.59		44.27	
638	*0119 66C	33.68	*0114 60C	649.69
639	.00		4212.77	
640	.00		4351.27	
641	.00		3133.94	
642	.00		1924.00	
643	.00		2267.46	
644	.00		3216.96	
645	.00		3458.01	
646	.00		2911.96	
647	.00		2438.28	
648	.00		3527.13	
649	.00		3760.87	
650	.00		4043.35	
651	*0114 608	84.87	*0114 808	364.65
652	74.15		435.69	
653	7.05		577.04	
654	20.64		565.48	
655	.00		373.90	

Figure F-4. Winters Forecasts
(page 8 of 41 pages)

656	.00		509.33	
657	.00		497.18	
658	50.91		480.51	
659	.00		539.14	
660	35.02		812.78	
661	.00		678.16	
662	.00		201.16	
663	.00		499.55	
664	*0114 80C	23.09	*0114 30B	66.12
665	6.91		247.05	
666	24.48		208.76	
667	25.24		208.18	
668	24.02		205.25	
669	32.89		162.18	
670	10.62		224.44	
671	11.11		212.02	
672	8.73		276.31	
673	11.30		311.72	
674	11.34		382.28	
675	20.09		399.01	
676	31.30		330.67	
677	*0114 30C	14.43	*0114 61C	21.42
678	.72		31.54	
679	.00		22.06	
680	6.46		18.79	
681	1.53		18.99	
682	12.34		25.07	
683	1.81		13.77	
684	18.00		8.49	
685	.00		19.30	
686	.00		21.97	
687	.00		14.66	
688	14.52		19.11	
689	3.79		27.68	
690	*0114 40C	20.16	*0156 60C	856.06
691	.00		3967.04	
692	.00		3617.24	
693	.00		3928.68	
694	.00		3231.27	
695	.00		3117.10	
696	.00		4073.57	
697	.00		3658.36	
698	.00		3763.36	
699	.00		3567.93	
700	.00		3490.21	
701	.00		4461.00	
702	.00		4227.95	
703	*0156 30C	528.16	*0156 80B	97.84
704	668.27		.00	
705	578.72		12.51	
706	642.83		.00	
707	497.18		.00	
708	444.54		.00	
709	622.47		.00	
710	568.07		.00	
711	641.97		.00	
712	649.34		.00	
713	771.46		.00	
714	916.69		13.34	
715	970.12		.00	
716	*0156 80C	133.61	*0156 61C	50.22
717	142.42		.00	
718	197.61		.00	
719	119.43		.00	
720	163.78		.00	
721	172.97		.00	
722	94.99		.00	
723	291.93		.00	
724	134.05		.00	
725	201.56		.00	
726	153.75		.00	
727	169.22		8.37	
728	203.41		3.60	
729	*0156 66C	.00	*0120 60C	521.03
730	5.51		1600.60	
731	11.56		1630.23	
732	17.58		2245.39	
733	1.43		1918.20	
734	19.08		1386.79	
735	42.66		2354.09	
736	4.65		2399.44	
737	.03		2388.98	

Figure F-4. Winters Forecasts
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738	4.33		2113.07	
739	8.18		1750.61	
740	8.76		1935.25	
741	6.28		1831.40	
742	*0120 60B	552.92	*0120 80B	2369.41
743	491.36		2902.77	
744	25.58		.00	
745	.00		.00	
746	.00		.00	
747	.00		.00	
748	.00		.00	
749	231.43		.00	
750	.00		.00	
751	.00		.00	
752	.00		726.11	
753	.00		.00	
754	.00		.00	
755	*0120 80C	50.22	*0120 30C	81.62
756	98.64		107.78	
757	76.33		116.96	
758	50.63		105.19	
759	38.43		94.83	
760	60.60		93.94	
761	25.49		80.02	
762	35.13		77.68	
763	34.28		110.84	
764	30.08		137.07	
765	47.15		98.03	
766	47.24		180.96	
767	49.26		59.39	
768	*0120 61C	64.83	*0120 11C	4.33
769	.00		.16	
770	.00		.00	
771	.00		.00	
772	.00		.00	
773	.00		.00	
774	.00		.00	
775	.00		.00	
776	.00		.00	
777	.00		.00	
778	3.23		.00	
779	.00		.00	
780	.00		2.79	
781	*0352 60C	811.08	*0352 60B	151.43
782	2325.95		24.63	
783	2061.39		.00	
784	2296.52		241.03	
785	1748.43		218.44	
786	1828.26		61.15	
787	2253.58		93.90	
788	2259.34		55.20	
789	2141.51		.00	
790	2157.42		.00	
791	2060.69		.00	
792	2340.83		192.44	
793	2402.36		134.54	
794	*0352 60B	1279.75	*0352 61C	113.35
795	.00		1.84	
796	.00		.00	
797	.00		.00	
798	6.72		.00	
799	.00		.00	
800	.00		.00	
801	.00		.00	
802	.00		.00	
803	.00		.00	
804	.00		.00	
805	2319.47		.00	
806	388.46		.00	
807	*0352 15C	31.35	*0352 40B	134.43
808	53.91		.00	
809	32.60		.00	
810	24.99		5.16	
811	16.67		.00	
812	26.34		.00	
813	65.58		165.58	
814	26.89		175.30	
815	64.45		29.05	
816	55.04		24.83	
817	42.29		129.03	
818	67.95		70.10	
819	55.19		188.36	

Figure F-4. Winters Forecasts
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820	*0352 40C	11.10	*0352 11C	23.18
821	.00		53.37	
822	.00		41.12	
823	.00		36.62	
824	.00		31.29	
825	.00		23.12	
826	8.15		9.31	
827	.00		35.19	
828	.00		7.15	
829	.00		16.84	
830	1.99		22.13	
831	.00		43.95	
832	.00		45.15	
833	*0451 60C	733.48	*0451 60B	736.13
834	658.25		609.01	
835	943.03		217.81	
836	923.17		632.73	
837	812.14		1129.19	
838	946.27		499.67	
839	1117.01		1417.97	
840	1476.90		944.97	
841	1735.84		1113.70	
842	996.66		660.00	
843	1300.64		1644.75	
844	862.57		685.08	
845	902.33		1338.58	
846	*0451 30C	127.54	*2703 30B	664.57
847	91.44		1742.27	
848	103.36		2147.75	
849	93.02		1778.92	
850	79.94		1526.76	
851	103.74		1551.67	
852	73.66		1908.66	
853	134.31		1752.63	
854	165.55		3275.30	
855	194.46		3443.07	
856	270.95		3286.67	
857	277.51		2609.43	
858	238.18		1664.08	
859	*2703 61B	207.28	*2703 61C	37.44
860	.00		77.42	
861	.00		18.31	
862	16.66		42.12	
863	.00		6.47	
864	.00		.00	
865	.00		.00	
866	.00		.00	
867	.00		.00	
868	38.07		.00	
869	.00		.00	
870	30.14		47.21	
871	16.34		182.34	
872	*2703 60B	80.33	*2703 80B	53.90
873	.00		5.33	
874	.00		.00	
875	.00		.00	
876	.00		.00	
877	.00		.00	
878	.00		.00	
879	.00		.66	
880	.00		.00	
881	4.53		21.07	
882	.00		.00	
883	.00		.00	
884	.00		.00	
885	*2703 40B	52.86	*0356 60C	1205.43
886	.00		2212.61	
887	.00		2378.69	
888	.00		1462.54	
889	.00		1607.58	
890	.00		1413.33	
891	.00		1911.69	
892	.00		2021.18	
893	.00		2055.18	
894	.00		2932.81	
895	66.85		2929.99	
896	.00		2083.37	
897	.00		3012.42	
898	*0356 30C	56.70	*0356 11C	83.07
899	70.03		.00	
900	38.14		114.76	
901	38.51		23.63	

Figure F-4. Winters Forecasts
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902	62.30		67.26	
903	30.02		16.17	
904	53.78		52.09	
905	42.24		21.21	
906	57.02		39.97	
907	82.68		15.41	
908	136.47		3.66	
909	79.68		12.68	
910	60.53		32.04	
911	*0356 15C	29.22	*0356 61C	61.42
912	48.45		.00	
913	45.55		.00	
914	22.96		.00	
915	53.43		.00	
916	32.27		.00	
917	66.99		.00	
918	41.19		.00	
919	51.11		.00	
920	44.52		.00	
921	45.74		.00	
922	58.88		.00	
923	55.23		.00	
924	*0332 60C	441.22	*0332 606	61.72
925	2175.24		28.04	
926	1608.41		6.51	
927	1764.72		32.48	
928	1929.76		22.40	
929	1873.64		3.50	
930	2280.88		122.19	
931	2465.62		30.55	
932	2543.12		41.84	
933	2617.91		20.91	
934	2713.40		19.83	
935	2372.00		32.61	
936	2379.90		18.12	
937	*0332 11C	19.01	*0332 61C	48.29
938	42.76		55.51	
939	53.61		30.77	
940	48.46		3.89	
941	59.81		28.16	
942	43.92		39.98	
943	34.89		8.25	
944	25.94		24.46	
945	37.49		50.10	
946	32.78		49.60	
947	47.18		87.57	
948	42.88		78.21	
949	47.32		52.84	
950	*0332 15C	25.85	*0332 30C	11.73
951	65.44		10.33	
952	50.21		3.48	
953	54.28		11.28	
954	67.54		18.03	
955	44.56		19.67	
956	60.76		5.69	
957	57.97		10.10	
958	64.69		18.05	
959	64.74		15.16	
960	86.57		21.11	
961	86.07		22.08	
962	84.33		20.83	
963	*0317 60C	391.00	*0317 30C	472.78
964	514.51		.00	
965	577.25		.00	
966	295.20		.00	
967	397.61		.00	
968	258.48		.00	
969	455.61		.00	
970	493.03		.00	
971	307.47		.00	
972	512.58		.00	
973	335.72		.00	
974	347.58		.00	
975	464.10		.00	
976	*0328 60C	454.66	*0326 606	60.92
977	1144.81		58.66	
978	1044.78		68.45	
979	1049.55		71.00	
980	965.42		21.93	
981	936.00		54.41	
982	1036.58		78.89	
983	1262.22		20.56	

Figure F-4. Winters Forecasts
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984	1237.49		34.93	
985	1000.57		55.24	
986	1052.59		12.60	
987	1007.98		37.79	
988	1127.64		19.35	
989	*0328 15C	61.80	*0328 80B	279.5[illegible]
990	3.57		59.89	
991	16.54		9.45	
992	.00		.00	
993	35.91		.00	
994	.00		.00	
995	83.42		.00	
996	38.73		.00	
997	54.70		.00	
998	27.64		.00	
999	26.69		19.02	
1000	24.98		.00	
1001	16.68		.00	
1002	*0328 80C	18.00	*0328 11C	39.69
1003	.00		.00	
1004	6.33		.00	
1005	8.68		.00	
1006	.00		19.71	
1007	.00		.00	
1008	20.14		20.43	
1009	.00		.00	
1010	.00		.00	
1011	12.90		.00	
1012	13.13		.00	
1013	.00		.00	
1014	.00		.00	
1015	*0328 61C	52.95	*0328 20C	80.91
1016	67.61		.00	
1017	45.76		.00	
1018	57.24		.00	
1019	53.59		.00	
1020	16.14		.00	
1021	48.15		.00	
1022	65.65		.00	
1023	50.50		.00	
1024	121.03		.00	
1025	91.58		.00	
1026	59.26		.00	
1027	74.08		.00	
1028	*0328 40C	2.83	*1718 70B	935.46
1029	1.13		2922.35	
1030	.00		3244.60	
1031	.00		2060.51	
1032	.00		2055.85	
1033	.00		2793.18	
1034	.13		2674.51	
1035	2.59		2135.91	
1036	.26		2990.88	
1037	.08		2577.39	
1038	.00		2450.57	
1039	.91		2710.55	
1040	.00		2401.28	
1041	*1718 306	1001.01	*1718 60C	357.73
1042	437.57		.00	
1043	66.62		.00	
1044	.00		.00	
1045	.00		.00	
1046	.00		.00	
1047	.00		.00	
1048	.00		.00	
1049	.00		.00	
1050	.00		.00	
1051	.00		.00	
1052	.00		.00	
1053	.00		.00	
1054	*1718 613	.00	*2020 703	190.77
1055	.00		171.92	
1056	.00		177.53	
1057	.00		153.73	
1058	2.40		135.34	
1059	.00		146.00	
1060	.00		154.47	
1061	.00		154.31	
1062	.00		121.86	
1063	.00		108.24	
1064	.00		63.52	
1065	.00		73.63	

Figure F-4. Winters Forecasts
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1066	.00		65.23	
1067	*2020 606	681.36	*2020 608	97.40
1068	1155.30		82.61	
1069	707.19		.00	
1070	677.68		82.98	
1071	725.62		4.70	
1072	516.75		.00	
1073	654.36		23.84	
1074	859.67		.00	
1075	610.69		.00	
1076	917.73		.00	
1077	473.31		.00	
1078	876.32		.00	
1079	804.19		.00	
1080	*2020 308	13.57	*0127 300	175.16
1081	.00		592.49	
1082	.00		505.18	
1083	.00		615.72	
1084	.00		621.37	
1085	2.16		508.34	
1086	1.49		640.94	
1087	6.44		674.91	
1088	13.64		793.59	
1089	7.34		945.98	
1090	.00		1209.90	
1091	.00		979.89	
1092	.00		759.36	
1093	*0127 306	40.96	*0127 600	243.55
1094	.00		487.52	
1095	.00		483.26	
1096	.00		568.25	
1097	.00		627.79	
1098	.00		616.64	
1099	.00		654.83	
1100	.00		628.95	
1101	.00		634.19	
1102	.00		699.91	
1103	.00		667.97	
1104	.00		626.02	
1105	.00		641.95	
1106	*0127 606	208.59	*0127 806	593.36
1107	19.17		.00	
1108	.00		.00	
1109	.00		405.62	
1110	.00		.00	
1111	.00		.00	
1112	.00		.00	
1113	.00		.00	
1114	.00		286.29	
1115	.00		259.64	
1116	.00		.00	
1117	.00		69.84	
1118	.00		157.14	
1119	*0256 600	1334.65	*0256 608	.00
1120	64.44		233.76	
1121	.00		617.27	
1122	.00		215.65	
1123	.00		269.22	
1124	.00		39.18	
1125	.00		387.41	
1126	.00		280.38	
1127	.00		94.61	
1128	.00		379.71	
1129	.00		110.37	
1130	.00		245.27	
1131	.00		27.90	
1132	*0256 806	.00	*0256 308	.00
1133	311.81		115.74	
1134	368.28		161.62	
1135	.00		194.60	
1136	436.63		221.01	
1137	.00		97.23	
1138	3868.18		243.65	
1139	.00		.00	
1140	49.60		.00	
1141	36.66		.00	
1142	.00		.00	
1143	.00		.00	
1144	.00		.00	
1145	*0256 610	.00	*0151 808	940.93
1146	7.75		97.67	
1147	11.64		231.77	

Figure F-4. Winters Forecasts
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1149	1.20		.00	
1149	23.36		16.53	
1150	11.38		1200.30	
1151	14.08		202.20	
1152	.00		.00	
1153	.00		409.80	
1154	19.60		150.47	
1155	.00		.00	
1156	.00		658.55	
1157	.00		198.12	
1158	*0151 600	.00	*0151 608	153.51
1159	262.41		50.48	
1160	105.50		73.62	
1161	196.94		94.28	
1162	125.00		71.04	
1163	76.83		70.16	
1164	712.98		124.59	
1165	102.00		63.11	
1166	232.21		.79	
1167	226.51		21.59	
1168	76.49		141.41	
1169	204.31		.00	
1170	43.02		84.90	
1171	*0123 600	212.50	*0123 608	242.69
1172	591.15		.00	
1173	571.61		.00	
1174	513.34		.00	
1175	543.33		.00	
1176	425.23		.00	
1177	346.13		.00	
1178	490.14		.00	
1179	547.75		.00	
1180	407.10		.00	
1181	618.81		.00	
1182	566.77		.00	
1183	500.98		.00	
1184	*0123 150	76.83	*0123 308	36.09
1185	169.74		19.30	
1186	150.79		.00	
1187	135.75		.00	
1188	138.06		.00	
1189	176.72		.00	
1190	164.58		.00	
1191	171.19		.00	
1192	156.24		.00	
1193	141.06		.00	
1194	152.93		.00	
1195	147.92		.00	
1196	125.80		.00	
1197	*2504 300	252.91	*2504 378	.00
1198	273.72		.00	
1199	598.04		.00	
1200	459.77		.00	
1201	262.05		.00	
1202	256.53		.00	
1203	422.54		.00	
1204	356.06		.00	
1205	775.07		.00	
1206	920.19		.00	
1207	434.76		578.35	
1208	207.44		574.71	
1209	147.34		437.94	
1210	*2504 600	89.60	*2504 800	222.36
1211	56.59		.00	
1212	31.13		.00	
1213	19.92		.00	
1214	17.49		.00	
1215	37.74		.00	
1216	20.45		.00	
1217	37.01		.00	
1218	20.44		.00	
1219	9.56		.00	
1220	14.22		.00	
1221	19.14		3.65	
1222	14.75		.00	
1223	*2504 660	.00	*5251 600	539.11
1224	.00		.00	
1225	.00		.00	
1226	.00		.00	
1227	.00		.00	
1228	3.50		.00	
1229	.00		.00	

Figure F-4. Winters Forecasts
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1230	.15		.00	
1231	.00		.00	
1232	.00		.00	
1233	.00		.00	
1234	.00		.00	
1235	100.71		.00	
1236	*5251 608	104.89	*5251 608	.00
1237	.00		.00	
1238	.00		.00	
1239	.00		13.63	
1240	.00		.00	
1241	.00		.00	
1242	.00		.00	
1243	.00		.00	
1244	.00		.00	
1245	.00		.00	
1246	.00		.00	
1247	.00		.00	
1248	.00		.00	
1249	*5251 616	23.10	*5251 308	4.59
1250	.00		.00	
1251	.00		3.04	
1252	.00		3.15	
1253	.00		1.32	
1254	.00		7.94	
1255	.00		.14	
1256	.00		.13	
1257	.00		2.50	
1258	.00		1.63	
1259	.00		6.23	
1260	.00		6.31	
1261	.00		1.51	
1262	*0329 608	4.30	*0329 308	28.45
1263	6.54		25.35	
1264	.00		56.58	
1265	.00		76.46	
1266	.00		50.65	
1267	.00		34.92	
1268	.00		47.81	
1269	.00		46.77	
1270	.00		52.01	
1271	.00		57.69	
1272	.00		47.44	
1273	.00		54.92	
1274	.00		62.43	
1275	*0329 150	16.43	*0329 808	92.21
1276	35.69		.00	
1277	29.75		.00	
1278	26.63		.00	
1279	31.46		.00	
1280	28.67		.00	
1281	34.21		.00	
1282	39.09		.00	
1283	40.77		.00	
1284	34.98		.00	
1285	50.90		16.33	
1286	51.40		.00	
1287	48.20		.00	
1288	*0329 610	46.48	*0329 110	7.80
1289	.00		12.89	
1290	.00		14.90	
1291	.00		10.08	
1292	.00		12.61	
1293	.00		14.63	
1294	.00		5.97	
1295	.00		9.38	
1296	.00		7.79	
1297	.00		8.41	
1298	.00		22.83	
1299	.00		12.06	
1300	.00		21.77	
1301	*0251 606	112.78	*0251 406	.00
1302	9.44		.00	
1303	62.01		.08	
1304	80.37		.00	
1305	35.44		.00	
1306	20.07		.00	
1307	39.72		.65	
1308	24.51		.00	
1309	1.27		.43	
1310	68.58		.00	
1311	6.59		.00	

Figure F-4. Winters Forecasts
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1312	.00		.00	
1313	47.03		.55	
1314	*5103 60C	95.20	*5103 80B	707.86
1315	101.59		.00	
1316	68.63		.00	
1317	43.60		.00	
1318	51.89		.00	
1319	78.29		.00	
1320	111.34		.00	
1321	77.56		477.88	
1322	187.72		.00	
1323	165.40		.00	
1324	156.63		.00	
1325	55.97		.00	
1326	76.65		.00	
1327	*5103 30C	171.07	*5103 30B	45.29
1328	.00		.00	
1329	.00		.00	
1330	.00		.00	
1331	.00		.00	
1332	.00		.00	
1333	.00		.00	
1334	.00		14.99	
1335	.00		10.65	
1336	.00		77.35	
1337	.00		14.25	
1338	.00		47.71	
1339	.00		9.89	
1340	*5103 40B	463.13	*5103 61B	70.18
1341	337.07		36.64	
1342	139.68		24.93	
1343	2.87		39.65	
1344	.00		61.25	
1345	14.37		36.80	
1346	.00		73.49	
1347	7.62		59.64	
1348	279.67		107.76	
1349	.00		73.34	
1350	.00		43.21	
1351	599.71		76.44	
1352	245.39		36.40	
1353	*5103 61C	.00	*2001 30C	47.72
1354	254.91		47.78	
1355	61.47		55.47	
1356	71.00		57.18	
1357	31.66		46.89	
1358	16.03		37.26	
1359	.00		51.27	
1360	63.25		104.06	
1361	30.63		90.80	
1362	62.26		104.87	
1363	39.76		75.48	
1364	28.55		60.66	
1365	.00		47.35	
1366	*2001 61C	48.78	*2001 60B	.00
1367	.00		320.16	
1368	.00		.00	
1369	.00		.00	
1370	.00		.00	
1371	.00		.00	
1372	.00		.00	
1373	.00		.00	
1374	.00		.00	
1375	.00		.00	
1376	.00		.00	
1377	.00		.00	
1378	.00		.00	
1379	*2001 60C	.00	*5051 60B	41.27
1380	.00		139.24	
1381	.00		70.01	
1382	.25		87.22	
1383	.00		70.23	
1384	.00		5.37	
1385	.00		.00	
1386	.00		.00	
1387	.00		.00	
1388	.00		.00	
1389	.00		.00	
1390	.00		.00	
1391	.00		.00	
1392	*5051 60C	.00	*5051 61B	11.17
1393	.00		.00	

Figure F-4. Winters Forecasts
(page 17 of 41 pages)

1394	5.19		.00	
1395	.00		10.18	
1396	.00		.00	
1397	.00		.00	
1398	.66		.00	
1399	.00		1.87	
1400	8.92		.00	
1401	.00		7.85	
1402	.00		6.50	
1403	.00		7.92	
1404	.00		.00	
1405	*0218 606	262.23	*0218 806	577.91
1406	.00		.00	
1407	.00		.00	
1408	.00		.00	
1409	.00		406.16	
1410	.00		.00	
1411	.00		.00	
1412	.00		.00	
1413	.00		.00	
1414	.00		.00	
1415	.00		220.20	
1416	.00		63.12	
1417	.00		259.07	
1418	*0218 306	10.45	*0218 610	.00
1419	1.69		.00	
1420	.00		1.70	
1421	.00		.00	
1422	.00		.00	
1423	.00		.00	
1424	.00		.00	
1425	.00		.00	
1426	.00		.00	
1427	.00		.00	
1428	.00		.00	
1429	.00		.00	
1430	.00		.00	
1431	*4601 606	329.30	*4601 306	.00
1432	.00		2.25	
1433	.00		.00	
1434	.00		.00	
1435	.00		2.00	
1436	.00		.00	
1437	59.93		.00	
1438	.00		.00	
1439	173.22		.00	
1440	.00		.00	
1441	.00		.00	
1442	.00		.00	
1443	.00		.00	
1444	*1401 666	85.23	*1401 306	42.22
1445	.00		144.91	
1446	.00		75.62	
1447	.00		87.69	
1448	.00		118.73	
1449	.00		75.60	
1450	.00		81.60	
1451	.00		82.05	
1452	.00		140.94	
1453	.00		246.32	
1454	.00		133.14	
1455	.00		160.67	
1456	.00		92.66	
1457	*1401 606	130.43	*1401 600	57.70
1458	.00		13.14	
1459	.00		52.37	
1460	.00		.00	
1461	.00		.94	
1462	.00		9.23	
1463	.00		38.81	
1464	.00		.00	
1465	.00		.00	
1466	.00		.00	
1467	.00		.00	
1468	.00		.00	
1469	.00		.00	
1470	*1401 806	148.35	*1401 610	33.35
1471	136.40		.00	
1472	.00		.00	
1473	.00		.00	
1474	.00		1.15	
1475	.00		.00	

Figure F-4. Winters Forecasts
(page 18 of 41 pages)

1476	.00		.00	
1477	.00		.00	
1478	.00		.00	
1479	.00		16.34	
1480	.00		3.49	
1481	.00		66.92	
1482	.00		63.79	
1483	*1401 61B	.00	*5601 30B	179.16
1484	.00		.00	
1485	.00		.00	
1486	6.35		.00	
1487	.00		.00	
1488	2.25		.00	
1489	.00		.00	
1490	.00		.00	
1491	.00		7.36	
1492	6.58		73.98	
1493	.00		5.40	
1494	.00		.00	
1495	.00		.00	
1496	*5601 60C	45.17	*5601 60B	30.14
1497	49.90		.00	
1498	.00		.00	
1499	.00		.00	
1500	.00		.00	
1501	.00		.00	
1502	.00		18.76	
1503	.00		3.93	
1504	.00		.00	
1505	.00		.00	
1506	.00		.00	
1507	.00		.00	
1508	.00		.00	
1509	*5601 61C	26.05	*5601 61B	19.11
1510	22.12		.00	
1511	21.98		.00	
1512	8.42		.00	
1513	3.06		.00	
1514	1.40		.00	
1515	6.03		.00	
1516	.00		.00	
1517	.00		.00	
1518	.00		.00	
1519	.00		.00	
1520	.00		3.23	
1521	.00		.00	
1522	*5601 80B	37.96	*1720 60C	.00
1523	.00		125.10	
1524	1.90		116.13	
1525	23.02		98.13	
1526	16.08		76.50	
1527	12.79		49.50	
1528	12.75		49.50	
1529	17.18		72.45	
1530	63.29		47.25	
1531	5.22		49.50	
1532	16.53		49.50	
1533	.00		13.50	
1534	14.28		49.50	
1535	*1720 60B	71.69	*1720 15C	91.63
1536	.00		.00	
1537	.00		.00	
1538	.00		51.60	
1539	.00		62.09	
1540	.00		66.44	
1541	.00		27.88	
1542	.00		.00	
1543	.00		.00	
1544	.00		.00	
1545	.00		.00	
1546	.00		.00	
1547	.00		.00	
1548	*1720 30B	.00	*1720 11C	2.47
1549	.00		.32	
1550	.00		.00	
1551	7.08		.96	
1552	.00		.71	
1553	.00		.00	
1554	.00		.00	
1555	.00		.00	
1556	.00		.00	
1557	.00		.00	

Figure F-4. Winters Forecasts
(page 19 of 41 pages)

1558	9.25		.00	
1559	.00		.00	
1560	.00		.00	
1561	*1901 308	81.10	*1901 61C	115.55
1562	.00		48.65	
1563	.00		39.61	
1564	.00		44.00	
1565	.00		49.41	
1566	.00		31.09	
1567	.00		50.01	
1568	.00		43.19	
1569	.00		2.06	
1570	.00		55.50	
1571	.00		62.78	
1572	.00		43.38	
1573	.00		90.62	
1574	*1901 60C	110.82	*2701 30C	.00
1575	9.57		.00	
1576	.00		.00	
1577	.00		.00	
1578	.00		.00	
1579	.00		.00	
1580	.00		.00	
1581	.00		.00	
1582	.00		236.75	
1583	.00		134.46	
1584	38.19		369.50	
1585	.00		574.93	
1586	73.10		377.98	
1587	*2701 808	84.14	*2701 608	62.96
1588	34.97		19.63	
1589	28.92		.00	
1590	6.86		.00	
1591	10.80		.00	
1592	11.96		.00	
1593	65.62		.00	
1594	22.73		.00	
1595	56.80		.00	
1596	62.70		.00	
1597	148.29		.00	
1598	24.96		.00	
1599	52.42		.00	
1600	*0427 608	135.55	*0427 308	76.28
1601	38.23		192.89	
1602	31.50		190.32	
1603	.00		191.90	
1604	.00		246.66	
1605	.00		188.22	
1606	2.51		231.68	
1607	.00		212.07	
1608	.00		251.30	
1609	.00		360.66	
1610	.00		511.91	
1611	.00		355.73	
1612	.00		376.40	
1613	*0427 30C	2.49	*0427 61C	13.54
1614	5.16		.00	
1615	3.58		3.59	
1616	1.41		.00	
1617	.90		.00	
1618	1.29		.00	
1619	2.74		.00	
1620	.36		.00	
1621	.91		5.83	
1622	1.53		.00	
1623	3.17		3.68	
1624	2.49		.00	
1625	2.31		.00	
1626	*0427 11C	.00	*5203 61B	171.78
1627	.00		.00	
1628	149.60		.00	
1629	.00		.00	
1630	.00		.00	
1631	.00		.00	
1632	.00		.00	
1633	.00		.00	
1634	.00		.00	
1635	.00		.00	
1636	.00		.00	
1637	.00		.00	
1638	.00		.00	
1639	*5203 605	139.77	*5203 60C	76.51

Figure F-4. Winters Forecasts
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1640	1.21		.00	
1641	5.42		.00	
1642	.00		.00	
1643	.00		.00	
1644	3.78		.00	
1645	.00		.00	
1646	.00		.00	
1647	106.48		.00	
1648	492.17		.00	
1649	.00		.00	
1650	.00		.00	
1651	.00		.00	
1652	*5203 406	130.25	*5203 808	.00
1653	.00		.00	
1654	.00		.00	
1655	.00		.00	
1656	.00		.00	
1657	.00		.00	
1658	.00		5.13	
1659	100.54		.00	
1660	.00		.00	
1661	231.66		488.55	
1662	.00		.00	
1663	.00		.00	
1664	.00		.00	
1665	*5203 30C	31.18	*5203 306	14.93
1666	.00		.00	
1667	.00		.00	
1668	.00		.00	
1669	.00		.00	
1670	.00		.00	
1671	.00		.00	
1672	.00		.00	
1673	.00		.00	
1674	.00		.00	
1675	.00		.00	
1676	.00		.00	
1677	.00		.00	
1678	*0301 305	122.58	*0301 603	36.63
1679	94.06		2.24	
1680	147.20		23.70	
1681	154.74		25.27	
1682	147.48		4.79	
1683	74.12		27.41	
1684	79.41		.00	
1685	150.49		.00	
1686	153.72		.00	
1687	231.57		7.60	
1688	174.55		2.48	
1689	156.66		.00	
1690	147.80		.00	
1691	*0146 60C	159.09	*0146 80C	.00
1692	220.92		.00	
1693	154.69		.00	
1694	220.03		.00	
1695	113.64		.00	
1696	270.60		.00	
1697	167.32		.00	
1698	218.12		.00	
1699	168.68		.00	
1700	246.02		.00	
1701	331.94		.00	
1702	215.22		54.54	
1703	309.67		11.26	
1704	*0103 30C	185.32	*0227 806	.00
1705	176.59		957.75	
1706	168.38		287.03	
1707	151.71		.00	
1708	111.24		450.96	
1709	152.67		1787.09	
1710	110.18		5301.98	
1711	125.63		.00	
1712	145.66		1479.04	
1713	190.48		.00	
1714	173.72		.00	
1715	501.15		.00	
1716	131.18		4715.25	
1717	*0227 306	101.82	*0227 606	133.88
1718	53.23		.00	
1719	92.95		.00	
1720	50.02		.00	
1721	210.18		.00	

Figure F-4. Winters Forecasts
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1722	127.68		11.42	
1723	81.98		.00	
1724	125.74		18.52	
1725	108.43		.00	
1726	156.26		.00	
1727	118.08		.00	
1728	143.64		.00	
1729	70.61		.00	
1730	*0227 61B	.00	*0214 60B	.00
1731	7.05		.00	
1732	1.75		.00	
1733	.00		.00	
1734	1.56		.00	
1735	.00		.00	
1736	11.58		.00	
1737	.00		.00	
1738	.00		6.26	
1739	.00		.03	
1740	.00		.00	
1741	.00		.03	
1742	.00		.08	
1743	*0214 30C	50.08	*0214 30B	.00
1744	169.40		28.14	
1745	110.06		43.34	
1746	150.78		41.01	
1747	96.71		.00	
1748	128.79		41.94	
1749	135.56		23.13	
1750	115.58		24.18	
1751	133.09		33.49	
1752	163.79		62.51	
1753	203.12		42.09	
1754	199.27		8.33	
1755	152.90		46.47	
1756	*0214 80C	.00	*0214 60B	.00
1757	.00		.00	
1758	.00		.00	
1759	.00		.00	
1760	.00		294.87	
1761	.00		.00	
1762	.00		.00	
1763	.00		.00	
1764	.00		.00	
1765	.00		.00	
1766	.00		.00	
1767	.00		51.45	
1768	42.99		50.76	
1769	*0214 61C	15.86	*1801 60C	.00
1770	33.67		280.68	
1771	15.04		.00	
1772	13.02		.00	
1773	15.98		.00	
1774	13.57		.00	
1775	14.44		.00	
1776	25.04		.00	
1777	20.76		30.38	
1778	14.77		7.50	
1779	25.57		.00	
1780	27.32		.00	
1781	25.20		.00	
1782	*1801 30C	29.40	*1601 30B	.00
1783	.00		.00	
1784	8.29		.00	
1785	.00		.00	
1786	.00		.00	
1787	.00		.00	
1788	.00		.00	
1789	.00		.00	
1790	8.95		11.83	
1791	31.17		.00	
1792	64.40		.00	
1793	41.43		.00	
1794	10.37		.00	
1795	*1801 61C	29.75	*0452 60B	67.92
1796	1.95		51.37	
1797	.00		34.57	
1798	.00		14.30	
1799	.00		109.66	
1800	.00		9.55	
1801	.00		93.28	
1802	.00		33.02	
1803	.00		10.93	

Figure F-4. Winters Forecasts
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1604	.00		15.06	
1605	3.69		21.58	
1606	.00		87.40	
1607	.00		80.64	
1608	*0452 61C	6.88	*0452 11C	.00
1609	15.78		.00	
1610	7.68		68.25	
1611	13.31		.00	
1612	9.55		.00	
1613	15.25		.00	
1614	8.75		.00	
1615	11.98		.00	
1616	10.83		.00	
1617	12.91		.00	
1618	24.58		.00	
1619	21.36		.00	
1620	18.84		.00	
1621	*0452 30C	.00	*0450 60B	54.60
1622	.00		21.66	
1623	.00		24.83	
1624	.00		14.53	
1625	.00		35.02	
1626	.00		23.90	
1627	.00		40.24	
1628	.00		49.87	
1629	.00		45.73	
1630	.00		23.89	
1631	.00		52.83	
1632	17.65		69.42	
1633	11.33		53.20	
1634	*0450 15C	.00	*0450 11C	.00
1635	39.68		.00	
1636	43.08		240.82	
1637	.00		.00	
1638	.00		.00	
1639	.00		.00	
1640	.00		.00	
1641	.00		.00	
1642	.00		.00	
1643	.00		.00	
1644	.00		.00	
1645	.00		.00	
1646	.00		.00	
1647	*0450 30C	.00	*0450 61C	.00
1648	.00		.00	
1649	.00		.00	
1650	.00		.00	
1651	.00		5.08	
1652	.00		.00	
1653	.00		2.50	
1654	.00		.00	
1655	9.60		.00	
1656	.00		.00	
1657	.00		8.24	
1658	.00		7.23	
1659	.00		3.65	
1660	*0210 60C	247.77	*0456 30C	25.46
1661	52.63		6.82	
1662	146.78		1.77	
1663	71.42		.00	
1664	107.96		1.40	
1665	62.20		2.47	
1666	77.43		3.10	
1667	52.21		8.26	
1668	55.85		10.50	
1669	112.65		4.36	
1670	66.74		3.19	
1671	373.15		17.29	
1672	223.48		16.80	
1673	*5602 30C	185.63	*5602 30C	.00
1674	.00		218.04	
1675	.00		110.62	
1676	.00		115.60	
1677	.00		148.48	
1678	.00		92.07	
1679	.00		118.56	
1680	.00		20.11	
1681	.00		408.09	
1682	.00		.00	
1683	.00		476.92	
1684	.00		227.77	
1685	.00		87.92	

Figure F-4. Winters Forecasts
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1886	*5602 808	.00	*5602 608	.00
1887	.00		.00	
1888	.00		.00	
1889	.00		.03	
1890	.00		.00	
1891	58.18		9.13	
1892	.00		.00	
1893	1618.80		1.37	
1894	3868.18		9.13	
1895	.00		26.18	
1896	.00		.00	
1897	29.15		.00	
1898	.00		28.68	
1899	*5602 600	38.90	*0115 800	.00
1900	36.39		.00	
1901	11.78		38.25	
1902	41.16		13.25	
1903	.00		.00	
1904	17.71		.00	
1905	9.31		.00	
1906	.00		.00	
1907	12.34		.00	
1908	.88		.00	
1909	53.36		.00	
1910	20.07		.00	
1911	29.07		19.50	
1912	*0115 608	232.96	*0115 600	.00
1913	98.45		.00	
1914	36.48		208.50	
1915	90.62		.00	
1916	84.30		.00	
1917	293.79		.25	
1918	111.98		446.24	
1919	83.87		93.51	
1920	130.20		196.84	
1921	86.86		98.51	
1922	34.65		30.62	
1923	394.50		.00	
1924	93.83		.00	
1925	*0115 308	18.46	*0115 618	.00
1926	7.05		.00	
1927	.00		.00	
1928	6.00		.00	
1929	.00		.00	
1930	.00		.00	
1931	.00		.00	
1932	.00		.00	
1933	.00		.00	
1934	.00		.00	
1935	.74		.00	
1936	3.55		57.40	
1937	22.98		.00	
1938	*5101 308	93.76	*5101 300	.00
1939	.00		107.52	
1940	.00		135.84	
1941	.00		89.63	
1942	.00		21.31	
1943	.00		36.71	
1944	.00		85.33	
1945	.00		243.97	
1946	.00		298.90	
1947	133.94		697.43	
1948	.00		376.09	
1949	.00		263.04	
1950	.00		225.14	
1951	*5101 808	160.07	*5101 608	124.07
1952	35.72		.00	
1953	.00		.00	
1954	.00		.00	
1955	12.06		4.18	
1956	.00		.00	
1957	.00		.00	
1958	.00		.00	
1959	35.02		.00	
1960	.00		181.58	
1961	.00		44.85	
1962	.00		45.97	
1963	22.19		42.15	
1964	*5101 618	11.09	*5101 408	.00
1965	4.87		.00	
1966	7.49		.00	
1967	11.06		.00	

Figure F-4. Winters Forecasts
(page 24 of 41 pages)

1968	12.25		.70	
1969	10.91		.00	
1970	23.26		.00	
1971	10.20		1.60	
1972	8.74		.00	
1973	12.69		.18	
1974	20.28		.05	
1975	8.75		.00	
1976	11.52		.43	
1977	*1301 608	31.57	*1301 308	.00
1978	.00		.00	
1979	.00		.00	
1980	.00		.00	
1981	.00		.00	
1982	.00		14.43	
1983	.00		.00	
1984	.00		.00	
1985	.00		.00	
1986	.00		7.50	
1987	.00		6.75	
1988	.00		.00	
1989	.00		.00	
1990	*5102 608	239.60	*5102 308	37.25
1991	.00		.00	
1992	.00		.00	
1993	.00		.00	
1994	.00		.00	
1995	.00		.00	
1996	.00		.00	
1997	.00		.27	
1998	.00		.00	
1999	.00		16.59	
2000	.00		.00	
2001	.00		.00	
2002	.00		.00	
2003	*5102 300	.00	*5102 615	16.69
2004	16.03		6.04	
2005	53.12		5.51	
2006	58.59		28.36	
2007	47.36		31.14	
2008	69.67		11.00	
2009	19.91		13.92	
2010	63.44		13.68	
2011	127.74		11.53	
2012	332.73		11.03	
2013	126.89		9.73	
2014	66.38		9.26	
2015	86.54		11.67	
2016	*5102 406	.00	*0102 608	.00
2017	.00		.00	
2018	.00		.00	
2019	.10		.00	
2020	.00		.00	
2021	.00		.00	
2022	.00		.00	
2023	.00		.00	
2024	.00		.00	
2025	.00		99.26	
2026	.00		.00	
2027	.05		72.58	
2028	.05		.00	
2029	*0102 306	14.61	*5232 608	.00
2030	.00		.00	
2031	.00		.00	
2032	.00		.15	
2033	.00		.00	
2034	.00		.00	
2035	.00		.00	
2036	.00		.00	
2037	.00		.00	
2038	.00		.00	
2039	.00		.00	
2040	.00		.00	
2041	.00		.00	
2042	*5152 608	404.41	*5152 612	11.33
2043	.00		2.09	
2044	.00		3.81	
2045	.00		7.00	
2046	.00		.00	
2047	.00		.73	
2048	.00		3.58	
2049	.00		7.49	

Figure F-4. Winters Forecasts
(page 25 of 41 pages)

2050	.00		5.36	
2051	.00		7.15	
2052	.00		.00	
2053	396.62		1.94	
2054	631.99		4.66	
2055	*5152 406	.00	*1703 309	.00
2056	15.56		.00	
2057	.00		.00	
2058	.00		.00	
2059	52.56		.00	
2060	.00		.00	
2061	.00		.00	
2062	.25		121.49	
2063	.00		184.90	
2064	.00		.00	
2065	.00		.00	
2066	87.00		.00	
2067	.00		.00	
2068	*1703 300	.00	*2803 618	.00
2069	25.71		12.55	
2070	30.04		.00	
2071	37.43		14.53	
2072	20.61		.00	
2073	27.31		.00	
2074	10.15		14.53	
2075	353.68		.00	
2076	.00		.00	
2077	.00		.00	
2078	30.41		.00	
2079	39.64		.00	
2080	6.65		16.08	
2081	*2803 600	55.59	*2803 602	81.17
2082	49.39		.00	
2083	115.02		.00	
2084	75.82		37.02	
2085	68.71		.00	
2086	81.40		.00	
2087	44.99		.00	
2088	59.03		.00	
2089	65.69		.00	
2090	53.12		.00	
2091	78.28		102.01	
2092	53.33		15.42	
2093	51.50		18.78	
2094	*0220 603	232.62	*0220 300	.00
2095	.00		8.13	
2096	93.94		.00	
2097	.00		.00	
2098	.00		.00	
2099	.00		.00	
2100	.00		.00	
2101	.00		.00	
2102	.00		.00	
2103	.00		.00	
2104	.00		.00	
2105	.00		.00	
2106	.00		.00	
2107	*0223 600	80.14	*0223 600	34.38
2108	.00		.00	
2109	8.18		.00	
2110	.00		.00	
2111	.00		.00	
2112	.00		.00	
2113	43.69		10.73	
2114	.00		.00	
2115	.00		.00	
2116	87.90		.00	
2117	2.65		.00	
2118	.00		.00	
2119	.00		.00	
2120	*0223 300	6.66	*0121 603	76.63
2121	6.30		.00	
2122	.16		.00	
2123	.36		.00	
2124	.00		.00	
2125	.16		.00	
2126	4.44		.00	
2127	.61		.00	
2128	3.20		.00	
2129	.00		.00	
2130	.00		.00	
2131	9.26		.00	

Figure F-4. Winters Forecasts
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2132	.66		.00	
2133	*0121 60C	.00	*0121 308	10.90
2134	124.01		.00	
2135	15.41		1.73	
2136	3.02		.00	
2137	.00		.00	
2138	5.74		.00	
2139	.00		.00	
2140	45.23		.00	
2141	.00		5.21	
2142	3.51		16.10	
2143	.00		16.30	
2144	.63		15.58	
2145	.00		3.35	
2146	*1501 606	.00	*0219 60C	138.39
2147	.00		.00	
2148	.00		.00	
2149	.00		.00	
2150	.00		.00	
2151	.00		.00	
2152	.00		.00	
2153	.00		.00	
2154	1479.61		.00	
2155	154.27		.00	
2156	.00		.00	
2157	.00		.00	
2158	.00		.00	
2159	*0219 606	16.33	*0219 30C	.00
2160	24.10		.00	
2161	.00		.00	
2162	8.77		.00	
2163	.00		.00	
2164	.00		.00	
2165	.00		10.65	
2166	.00		.00	
2167	.00		.00	
2168	1.01		.00	
2169	.00		.00	
2170	.00		.00	
2171	.00		.00	
2172	*5250 60C	156.50	*5250 80C	.00
2173	107.24		.00	
2174	41.13		.00	
2175	49.30		134.40	
2176	38.76		.00	
2177	61.01		.00	
2178	61.47		109.64	
2179	42.15		77.23	
2180	66.41		.00	
2181	143.67		.00	
2182	153.72		184.97	
2183	142.56		8.65	
2184	215.56		.00	
2185	*5250 618	11.10	*5250 308	.00
2186	8.21		.00	
2187	2.13		.00	
2188	.00		.00	
2189	.00		.00	
2190	4.20		1.60	
2191	2.64		.00	
2192	.00		.00	
2193	.00		.00	
2194	.31		8.65	
2195	.00		.00	
2196	.00		.00	
2197	5.57		.00	
2198	*5052 306	.00	*5052 613	.00
2199	.00		.00	
2200	.00		.00	
2201	.00		.00	
2202	.00		3.75	
2203	.00		.00	
2204	5.78		.00	
2205	.00		.00	
2206	.00		.00	
2207	.00		94.13	
2208	.00		.00	
2209	.00		.00	
2210	.00		.00	
2211	*5052 308	.00	*1902 30C	41.55
2212	.00		49.79	
2213	.00		71.25	

Figure F-4. Winters Forecasts
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2214	.00		48.66	
2215	.00		37.40	
2216	.00		55.34	
2217	.00		41.50	
2218	.00		31.41	
2219	.00		31.60	
2220	9.78		54.07	
2221	.00		53.45	
2222	.00		37.79	
2223	.00		23.59	
2224	*1902 600	.00	*0113 603	117.22
2225	12.78		51.86	
2226	.00		272.56	
2227	.00		82.25	
2228	.00		76.72	
2229	93.47		76.91	
2230	.00		68.63	
2231	.00		76.74	
2232	.00		73.01	
2233	.00		72.21	
2234	139.99		66.75	
2235	.00		64.54	
2236	.00		61.85	
2237	*0113 618	.00	*0113 308	11.26
2238	62.93		2.79	
2239	58.46		.05	
2240	2.53		6.86	
2241	.00		2.19	
2242	26.83		.00	
2243	51.70		.00	
2244	53.08		.00	
2245	10.69		.00	
2246	45.91		7.91	
2247	.00		18.74	
2248	.00		11.46	
2249	3.63		11.06	
2250	*0113 406	.00	*0215 608	473.68
2251	.00		1543.34	
2252	.65		832.24	
2253	.00		390.68	
2254	.00		.00	
2255	.00		.00	
2256	.35		.00	
2257	.00		.00	
2258	.00		.00	
2259	.00		.00	
2260	.00		.00	
2261	.00		.00	
2262	11.91		.00	
2263	*0215 600	.00	*0215 303	10.74
2264	.00		2.95	
2265	.00		.00	
2266	.00		6.90	
2267	.03		5.94	
2268	2.33		1.44	
2269	201.71		.34	
2270	862.54		.00	
2271	314.12		.00	
2272	.00		.00	
2273	.00		.00	
2274	.00		.00	
2275	.00		.00	
2276	*5003 600	10.78	*5003 610	14.11
2277	1.49		5.17	
2278	.00		.00	
2279	.00		3.22	
2280	.00		3.35	
2281	.00		1.24	
2282	.00		.00	
2283	.00		7.34	
2284	.00		3.50	
2285	.00		19.18	
2286	.00		18.06	
2287	.00		6.69	
2288	.00		7.03	
2289	*5003 610	28.56	*5003 300	9.74
2290	15.43		.00	
2291	.00		3.17	
2292	.00		2.15	
2293	.00		.00	
2294	.00		.00	
2295	.00		.00	

Figure F-4. Winters Forecasts
(page 28 of 41 pages)

2296	.00		.00	
2297	.00		.00	
2298	.00		.00	
2299	11.16		3.35	
2300	19.00		.00	
2301	20.68		.00	
2302	*5003 30B	10.43	*0101 80B	.00
2303	.00		.00	
2304	.00		.00	
2305	.00		1322.93	
2306	.00		.00	
2307	.00		.00	
2308	.00		1183.90	
2309	13.84		.00	
2310	.00		1322.60	
2311	.00		.00	
2312	.00		.00	
2313	.00		.00	
2314	.00		.00	
2315	*1402 60C	39.46	*1402 80B	.00
2316	.00		.00	
2317	.00		.00	
2318	.00		.00	
2319	.00		.00	
2320	.00		.00	
2321	.00		263.00	
2322	18.10		.00	
2323	.00		100.00	
2324	.00		61.05	
2325	.00		.00	
2326	5.64		.00	
2327	.00		.00	
2328	*1402 80C	.00	*1402 61C	14.63
2329	.00		.00	
2330	.00		.00	
2331	.00		.00	
2332	8.35		.00	
2333	.00		.00	
2334	.00		.00	
2335	5.00		.00	
2336	.00		.00	
2337	.00		.00	
2338	.00		.00	
2339	.00		.00	
2340	.00		.00	
2341	*5603 30C	49.35	*5603 30B	.00
2342	102.62		.00	
2343	99.37		.00	
2344	122.23		.00	
2345	46.91		.00	
2346	57.10		20.30	
2347	49.67		19.95	
2348	108.53		.00	
2349	101.28		.00	
2350	137.23		.00	
2351	105.19		.00	
2352	67.00		.00	
2353	67.48		.00	
2354	*5603 60C	32.00	*5603 60B	.00
2355	1.54		.00	
2356	10.44		.00	
2357	.00		.00	
2358	.00		.00	
2359	.00		.00	
2360	.00		.00	
2361	1.13		.00	
2362	22.26		6.20	
2363	.00		196.56	
2364	37.33		.00	
2365	.00		.00	
2366	18.34		.00	
2367	*5603 61C	46.20	*5603 80B	.00
2368	.00		.00	
2369	.00		.00	
2370	.00		.00	
2371	.00		.00	
2372	.00		56.70	
2373	.00		131.25	
2374	.00		.00	
2375	.00		.00	
2376	.00		.00	
2377	.00		.00	

Figure F-4. Winters Forecasts
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2378	.00		.00	
2379	.00		.00	
2380	*0129 608	.00	*0125 808	.00
2381	.00		.00	
2382	.00		.00	
2383	.00		.00	
2384	24.75		.00	
2385	.00		.00	
2386	.00		.00	
2387	.33		.00	
2388	.00		74.38	
2389	.00		.00	
2390	.00		.00	
2391	.00		.00	
2392	.00		.00	
2393	*0129 30C	15.91	*0432 11C	.00
2394	20.67		.00	
2395	22.43		148.88	
2396	13.49		.00	
2397	16.45		.00	
2398	25.32		.00	
2399	24.16		.00	
2400	21.52		.00	
2401	14.16		.00	
2402	17.58		.00	
2403	25.76		.00	
2404	[illegible]4.38		.00	
2405	18.42		.00	
2406	*0432 30C	.00	*0432 61C	19.28
2407	21.28		.00	
2408	8.85		.00	
2409	.00		.00	
2410	.00		3.19	
2411	.00		.00	
2412	9.45		.00	
2413	.00		.00	
2414	.00		10.24	
2415	9.30		.00	
2416	31.71		.00	
2417	48.03		41.42	
2418	.00		8.40	
2419	*0152 608	50.61	*0152 60[illegible]	.00
2420	.00		71.66	
2421	.00		.00	
2422	.00		.00	
2423	.00		.00	
2424	.00		.00	
2425	.00		.00	
2426	.00		90.50	
2427	.00		490.38	
2428	6.11		241.5[illegible]	
2429	.00		.00	
2430	.00		.00	
2431	72.68		.00	
2432	*0310 406	108.27	*0310 608	.00
2433	202.46		56.88	
2434	346.65		197.61	
2435	112.07		.00	
2436	102.66		.00	
2437	548.29		77.69	
2438	120.56		503.56	
2439	100.65		735.58	
2440	270.13		181.04	
2441	171.07		.00	
2442	184.48		91.65	
2443	95.49		.00	
2444	87.41		.00	
2445	*5229 60C	.00	*5127 808	.00
2446	198.23		.00	
2447	157.57		.00	
2448	41.90		106.39	
2449	66.10		91.83	
2450	36.76		24.58	
2451	177.45		.00	
2452	139.06		157.00	
2453	98.15		.00	
2454	76.27		164.39	
2455	182.66		.00	
2456	150.56		117.73	
2457	248.31		52.06	
2458	*5127 608	266.22	*5127 308	19.18
2459	.00		19.01	

Figure F-4. Winters Forecasts
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2460	.00		.00	
2461	.00		15.19	
2462	.00		8.55	
2463	.00		6.32	
2464	.00		2.36	
2465	.00		11.26	
2466	.00		14.45	
2467	.00		30.33	
2468	.00		31.76	
2469	.00		29.26	
2470	.00		9.69	
2471	*5127 300	.00	*5127 618	.00
2472	.00		4.78	
2473	.00		5.98	
2474	21.98		75.39	
2475	13.36		.00	
2476	.00		5.50	
2477	.00		.00	
2478	9.00		4.63	
2479	14.78		.00	
2480	.00		30.58	
2481	.00		.00	
2482	.00		36.34	
2483	.00		.00	
2484	*0302 306	43.60	*0302 609	20.78
2485	36.12		9.73	
2486	56.04		7.04	
2487	43.68		.00	
2488	35.00		.00	
2489	19.58		.00	
2490	12.19		.00	
2491	44.21		.00	
2492	19.10		.00	
2493	50.62		.00	
2494	52.88		.00	
2495	30.41		.00	
2496	44.50		.00	
2497	*2751 808	97.80	*2751 606	37.88
2498	14.51		.94	
2499	.00		.00	
2500	.00		2.29	
2501	.00		46.57	
2502	.00		39.73	
2503	.00		.00	
2504	246.79		3.50	
2505	134.63		1.75	
2506	162.55		13.03	
2507	133.59		.00	
2508	163.97		.00	
2509	131.25		4.91	
2510	*2751 600	.00	*2751 306	16.01
2511	.00		10.34	
2512	.00		3.63	
2513	.00		3.32	
2514	22.91		21.39	
2515	.00		13.56	
2516	.00		.67	
2517	.00		9.60	
2518	.00		33.64	
2519	.00		22.51	
2520	.00		18.96	
2521	10.20		20.62	
2522	.00		19.07	
2523	*2751 300	.00	*5227 600	33.80
2524	.00		.00	
2525	.00		.00	
2526	.00		.00	
2527	.00		.00	
2528	.00		.00	
2529	.00		.00	
2530	.00		.00	
2531	8.90		.00	
2532	.00		.00	
2533	.00		.00	
2534	.00		.00	
2535	.00		288.53	
2536	*5227 606	19.12	*5227 613	20.62
2537	27.63		10.33	
2538	10.19		1.39	
2539	4.20		.00	
2540	2.61		.00	
2541	6.03		4.75	

Figure F-4. Winters Forecasts
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2542	31.98		7.46	
2543	10.79		.00	
2544	2.68		3.95	
2545	5.29		.00	
2546	4.60		25.42	
2547	21.84		1.21	
2548	3.74		16.08	
2549	*5227 61C	.00	*5227 308	4.65
2550	.00		.23	
2551	.00		.00	
2552	1.40		.00	
2553	35.10		.00	
2554	2.18		.00	
2555	6.23		.24	
2556	.00		.00	
2557	.00		.00	
2558	70.63		3.45	
2559	.00		.00	
2560	26.86		3.33	
2561	.00		3.20	
2562	*5201 606	24.53	*5201 30C	18.07
2563	.00		.00	
2564	8.34		.00	
2565	.00		.00	
2566	33.34		.00	
2567	5.89		.00	
2568	.00		.00	
2569	6.38		.00	
2570	.00		.00	
2571	.00		12.90	
2572	.00		.00	
2573	.00		.00	
2574	.00		.00	
2575	*5201 306	33.74	*5201 61C	.00
2576	4.31		50.78	
2577	13.50		42.48	
2578	22.37		7.40	
2579	9.66		.00	
2580	.30		12.33	
2581	.00		.00	
2582	.00		.00	
2583	.00		.00	
2584	.00		29.56	
2585	.00		.00	
2586	.00		.00	
2587	.00		.00	
2588	*3250 608	.00	*3251 60C	96.09
2589	.00		.00	
2590	.00		.00	
2591	.00		.00	
2592	.00		.00	
2593	.00		.00	
2594	.00		.00	
2595	.08		.00	
2596	.00		.00	
2597	5.45		.00	
2598	.00		.00	
2599	.45		.00	
2600	20.63		.00	
2601	*3251 606	210.69	*3251 61C	.00
2602	.00		.00	
2603	.00		50.15	
2604	.00		.00	
2605	.00		.00	
2606	.00		23.13	
2607	.00		9.60	
2608	.00		.00	
2609	.00		.00	
2610	.00		.00	
2611	.00		33.90	
2612	.00		33.13	
2613	.00		29.10	
2614	*3251 30C	.00	*2728 609	19.0[illegible]
2615	.00		.00	
2616	.00		.00	
2617	.00		.00	
2618	.00		.00	
2619	29.10		.00	
2620	9.00		.00	
2621	.00		.00	
2622	.00		.00	
2623	.00		.00	

Figure F-4. Winters Forecasts
(page 32 of 41 pages)

2624	20.00		.00	
2625	.00		.00	
2626	7.80		6.64	
2627	*2728 80B	65.38	*2728 80C	.00
2628	26.21		68.92	
2629	6.82		.00	
2630	35.12		170.55	
2631	22.67		31.45	
2632	49.17		18.95	
2633	52.35		139.70	
2634	6.95		.00	
2635	54.77		.00	
2636	117.54		.00	
2637	168.25		.00	
2638	42.14		40.40	
2639	65.84		.00	
2640	*2728 61C	.00	*2728 40C	2.93
2641	.00		.00	
2642	.00		.00	
2643	.00		.00	
2644	4.65		.00	
2645	12.68		.00	
2646	.00		.00	
2647	.00		.00	
2648	.00		.00	
2649	.00		.00	
2650	32.00		.00	
2651	.00		.00	
2652	.00		.00	
2653	*3203 60B	.00	*3203 61C	28.62
2654	5.13		.00	
2655	12.30		.00	
2656	.00		6.77	
2657	.00		.00	
2658	.00		.00	
2659	.00		.00	
2660	.00		.00	
2661	224.74		.00	
2662	.00		.00	
2663	.00		.00	
2664	.00		.00	
2665	.00		.00	
2666	*3203 30C	19.29	*2702 60B	14.63
2667	.00		.00	
2668	.00		.00	
2669	.00		.00	
2670	.00		.00	
2671	.00		.00	
2672	.00		13.88	
2673	.00		.00	
2674	.00		.00	
2675	.00		.00	
2676	.00		.00	
2677	.00		.00	
2678	.00		.00	
2679	*2772 30B	.00	*5132 61B	.00
2680	.00		.00	
2681	.00		.00	
2682	.00		.00	
2683	75.91		.00	
2684	.00		.00	
2685	.00		.00	
2686	.00		10.45	
2687	.00		.00	
2688	.00		41.10	
2689	.00		.00	
2690	.00		.00	
2691	.00		.00	
2692	*2903 61C	.00	*2903 61B	15.96
2693	.00		.00	
2694	.00		.00	
2695	.00		.00	
2696	.00		.00	
2697	.50		.00	
2698	.00		.00	
2699	4.08		.00	
2700	.00		.00	
2701	.00		.00	
2702	.00		.00	
2703	.00		.00	
2704	.00		.00	
2705	*2903 60B	42.17	*2903 60C	.00

Figure F-4. Winters Forecasts
(page 33 of 41 pages)

2706	63.27		2.23	
2707	32.43		.00	
2708	2.42		1.33	
2709	.00		12.48	
2710	.00		.00	
2711	.00		.00	
2712	.00		.00	
2713	.00		.00	
2714	.00		234.00	
2715	.00		.00	
2716	.00		.00	
2717	.00		.00	
2718	*0333 61B	.00	*0333 60C	.00
2719	.00		5.03	
2720	2.00		.00	
2721	.00		.00	
2722	.00		.00	
2723	24.38		.00	
2724	10.70		.00	
2725	.00		.00	
2726	39.20		.00	
2727	55.43		.00	
2728	.00		.00	
2729	.00		.00	
2730	.00		.00	
2731	*0333 60B	.00	*1717 60B	28.23
2732	.00		.00	
2733	5.58		.00	
2734	.20		.00	
2735	9.95		.00	
2736	5.69		.00	
2737	12.90		.00	
2738	6.79		.00	
2739	5.64		.00	
2740	9.70		.00	
2741	14.90		.00	
2742	3.89		.00	
2743	1.41		.00	
2744	*1717 61B	22.45	*5252 30B	2.75
2745	.00		.00	
2746	.00		.00	
2747	.00		.00	
2748	.00		.13	
2749	.00		.00	
2750	.00		.00	
2751	.00		.00	
2752	.00		.00	
2753	.00		.00	
2754	.00		.00	
2755	.00		.18	
2756	.00		.00	
2757	*0252 60B	106.95	*0166 60M	.00
2758	.00		.00	
2759	.00		.00	
2760	.00		.00	
2761	.00		.00	
2762	.00		.00	
2763	.00		.00	
2764	.00		.00	
2765	.00		.00	
2766	.00		.00	
2767	.00		73.30	
2768	.00		.00	
2769	.00		.00	
2770	*1917 30C	.00	*5104 30B	19.10
2771	.00		.00	
2772	13.60		.00	
2773	.00		.00	
2774	9.45		.00	
2775	14.95		.00	
2776	.00		.00	
2777	19.03		.00	
2778	11.65		3.40	
2779	.00		17.33	
2780	9.75		.00	
2781	.00		.00	
2782	13.40		.00	
2783	*5104 61B	.00	*5104 61C	67.00
2784	97.79		90.22	
2785	13.55		68.40	
2786	.00		1.93	
2787	.00		.00	

Figure F-4. Winters Forecasts
(page 34 of 41 pages)

2788	26.73		.00	
2789	.00		.00	
2790	.00		.00	
2791	.00		.00	
2792	16.08		.00	
2793	.00		.00	
2794	.00		.00	
2795	.00		.00	
2796	*0232 606	.00	*1719 608	.00
2797	.00		.00	
2798	10.74		.00	
2799	.00		.00	
2800	.72		.00	
2801	.00		25.96	
2802	.00		.00	
2803	.00		.00	
2804	.00		.00	
2805	.00		.00	
2806	.00		.00	
2807	.00		.00	
2808	.00		.00	
2809	*1719 300	10.07	*5204 610	18.46
2810	.00		19.13	
2811	.00		.53	
2812	.00		11.74	
2813	.00		26.82	
2814	.00		15.14	
2815	.00		3.41	
2816	.00		10.02	
2817	.00		14.21	
2818	.00		3.52	
2819	.00		15.10	
2820	.00		14.96	
2821	.00		9.63	
2822	*5204 300	.00	*2729 608	17.68
2823	.00		13.90	
2824	.00		8.36	
2825	.00		16.50	
2826	.00		14.41	
2827	.00		19.21	
2828	2.90		10.68	
2829	10.53		8.84	
2830	29.73		19.81	
2831	.00		12.15	
2832	12.65		11.70	
2833	.00		15.71	
2834	.00		29.68	
2835	*2729 306	17.31	*0144 308	34.76
2836	25.69		.00	
2837	2.52		.00	
2838	4.55		.00	
2839	.00		.00	
2840	.00		.00	
2841	.00		.00	
2842	.00		.00	
2843	.00		.00	
2844	.00		31.93	
2845	.00		.00	
2846	.00		.00	
2847	20.71		.00	
2848	*0144 606	.00	*3252 605	6.39
2849	.07		.00	
2850	59.03		.00	
2851	.00		.00	
2852	143.53		.00	
2853	.00		.00	
2854	104.98		.00	
2855	.00		.00	
2856	.00		.00	
2857	.00		.00	
2858	5.11		.00	
2859	1.38		.00	
2860	7.16		.00	
2861	*5150 606	.00	*5150 616	19.75
2862	.00		4.44	
2863	23.05		.05	
2864	.00		.00	
2865	.00		.00	
2866	.00		.00	
2867	.00		.00	
2868	.00		.00	
2869	.30		.00	

Figure F-4. Winters Forecasts
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2870	.00		.00	
2871	.00		.00	
2872	.00		.00	
2873	.00		53.98	
2874	*5001 608	6.12	*1413 610	.00
2875	.00		.00	
2876	.00		.00	
2877	.00		.00	
2878	.00		.00	
2879	.00		.00	
2880	.00		12.37	
2881	.00		24.53	
2882	8.14		.00	
2883	.00		.00	
2884	.00		.00	
2885	.00		.00	
2886	.00		.00	
2887	*2927 308	.00	*2927 300	.00
2888	.00		16.36	
2889	.00		.00	
2890	15.73		.00	
2891	.00		24.13	
2892	.00		.00	
2893	.00		.00	
2894	.00		.00	
2895	.00		7.95	
2896	.00		38.33	
2897	.00		9.43	
2898	.00		33.64	
2899	9.23		18.00	
2900	*2927 618	8.58	*2927 610	.00
2901	.00		.00	
2902	2.35		.00	
2903	.00		.00	
2904	2.26		13.88	
2905	.00		1.55	
2906	.00		.00	
2907	.00		.00	
2908	2.60		.00	
2909	5.00		.00	
2910	5.65		.00	
2911	.00		.00	
2912	6.31		13.96	
2913	*2017 600	.00	*2017 608	.00
2914	45.00		46.99	
2915	.00		6.00	
2916	20.50		.00	
2917	36.25		.00	
2918	.00		.00	
2919	90.00		.00	
2920	.00		.00	
2921	36.25		.00	
2922	.00		.00	
2923	42.50		.00	
2924	.00		.00	
2925	.00		.00	
2926	*2017 300	6.58	*2752 608	3.55
2927	1.56		3.68	
2928	.00		1.88	
2929	.99		1.01	
2930	.00		.00	
2931	.00		.00	
2932	4.20		.00	
2933	.00		.00	
2934	1.95		.00	
2935	.52		.00	
2936	4.04		.00	
2937	.00		.00	
2938	.00		.00	
2939	*2752 618	.00	*2732 608	5.08
2940	.00		.00	
2941	.00		.00	
2942	.00		.00	
2943	.00		.00	
2944	.00		.00	
2945	.00		.00	
2946	.00		.00	
2947	.00		.00	
2948	.00		.00	
2949	.00		1.91	
2950	40.75		.00	
2951	1.20		1.63	

Figure F-4. Winters Forecasts
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2952	*2732 60C		.00	*2732 308		.00
2953		.00			.00	
2954		.00			.00	
2955		.00			.00	
2956		.60			8.13	
2957		.00			14.35	
2958		.00			.00	
2959		.00			.00	
2960		.00			.00	
2961		.00			10.50	
2962		.00			.00	
2963		2.00			8.78	
2964		.00			.00	
2965	*1919 60M		4.57	*5027 61C		.00
2966		4.85			.00	
2967		6.14			.00	
2968		3.37			.00	
2969		6.53			.00	
2970		2.14			.00	
2971		1.72			.00	
2972		5.78			.00	
2973		1.72			.00	
2974		2.37			.00	
2975		3.18			20.90	
2976		6.75			.00	
2977		5.57			.00	
2978	*5027 60B		2.25	*5027 60C		.00
2979		.00			.96	
2980		.00			.00	
2981		.00			.00	
2982		.00			.55	
2983		.00			.00	
2984		.00			.00	
2985		.00			.37	
2986		.00			.00	
2987		.00			.93	
2988		.00			.00	
2989		.00			.00	
2990		.00			.00	
2991	*0149 60B		.00	*0149 60C		.00
2992		5.25			.00	
2993		.00			.00	
2994		.00			30.00	
2995		.00			16.50	
2996		.00			.00	
2997		.00			.00	
2998		.00			.00	
2999		.00			.00	
3000		5.25			.00	
3001		.00			.00	
3002		.00			.00	
3003		.00			.00	
3004	*0149 30B		.00	*1802 60C		.00
3005		.00			.00	
3006		.00			.00	
3007		.00			.00	
3008		8.38			2.15	
3009		.00			.00	
3010		.00			81.48	
3011		.00			27.00	
3012		.00			.00	
3013		.00			.00	
3014		9.00			.00	
3015		11.40			.00	
3016		.00			269.28	
3017	*1802 30C		13.68	*1313 60B		25.61
3018		.00			13.73	
3019		.00			.00	
3020		.00			.00	
3021		.00			.00	
3022		.00			.00	
3023		.00			.00	
3024		.00			.00	
3025		.00			.00	
3026		1.67			.00	
3027		.00			.00	
3028		.00			.00	
3029		.00			.00	
3030	*1920 30C		.00	*5614 30B		.00
3031		.00			.00	
3032		21.10			.00	
3033		.00			32.43	

Figure F-4. Winters Forecasts
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3034	.00		.00	
3035	.00		.00	
3036	.00		.00	
3037	13.75		.00	
3038	7.73		11.18	
3039	.00		.00	
3040	7.68		24.58	
3041	.00		.00	
3042	11.13		.00	
3043	*2951 308	12.99	*2901 61C	.00
3044	8.51		7.30	
3045	15.64		.00	
3046	15.93		.00	
3047	10.47		.00	
3048	12.35		1.93	
3049	13.14		.00	
3050	8.22		.00	
3051	13.92		.00	
3052	19.50		.00	
3053	20.78		.00	
3054	12.38		.00	
3055	18.99		.00	
3056	*2901 616	.00	*0145 306	6.39
3057	.00		.00	
3058	.00		3.22	
3059	.00		2.28	
3060	9.93		.00	
3061	.00		9.45	
3062	.00		.00	
3063	.00		.73	
3064	1.13		.00	
3065	.00		.00	
3066	.00		.29	
3067	.00		3.84	
3068	1.13		.00	
3069	*3201 608	.00	*0244 608	.00
3070	3.40		.00	
3071	.00		.00	
3072	.00		.00	
3073	.00		5.63	
3074	.00		.00	
3075	192.36		.00	
3076	.00		.00	
3077	.00		.00	
3078	.00		.00	
3079	.00		.00	
3080	3.70		.00	
3081	.00		.00	
3082	*0244 306	6.01	*0122 608	.00
3083	.00		.00	
3084	2.25		.00	
3085	.00		.00	
3086	1.91		.00	
3087	.00		.00	
3088	.40		13.28	
3089	.00		.00	
3090	.00		41.00	
3091	.00		.00	
3092	8.30		.00	
3093	2.53		.03	
3094	3.55		.00	
3095	*0122 306	7.52	*0116 61C	.00
3096	4.42		.00	
3097	.00		.00	
3098	.00		59.20	
3099	1.06		22.65	
3100	1.00		.00	
3101	5.33		18.68	
3102	1.84		.00	
3103	10.06		.00	
3104	1.73		67.50	
3105	.00		9.93	
3106	4.14		.00	
3107	3.03		4.98	
3108	*0116 30C	.00	*0116 60C	1.28
3109	.00		.00	
3110	.00		.00	
3111	.00		2.73	
3112	.00		.01	
3113	19.23		.81	
3114	.00		.33	
3115	.00		.30	

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3116	11.73		.25	
3117	33.90		.36	
3118	10.00		.00	
3119	21.50		.34	
3120	.00		.56	
3121	*1714 308	.00	*5202 608	16.70
3122	.00		.00	
3123	.00		.00	
3124	.00		.00	
3125	.00		.00	
3126	.00		.00	
3127	10.60		.00	
3128	38.56		.00	
3129	.00		.00	
3130	.00		.00	
3131	15.18		.00	
3132	.00		.00	
3133	79.62		.00	
3134	*5117 308	.00	*0130 308	.00
3135	.00		.00	
3136	.00		.00	
3137	.00		.00	
3138	.00		.00	
3139	.00		.00	
3140	.00		.00	
3141	.00		.00	
3142	20.13		8.63	
3143	51.47		8.45	
3144	17.58		.00	
3145	.00		.00	
3146	.00		.00	
3147	*0429 308	13.55	*3403 308	.00
3148	8.63		.00	
3149	4.37		.00	
3150	.00		.00	
3151	.00		.00	
3152	.00		.00	
3153	.00		.00	
3154	.00		.00	
3155	.00		.00	
3156	.00		7.73	
3157	1.61		17.29	
3158	12.77		.00	
3159	6.77		.00	
3160	*0109 618	9.46	*0165 308	.00
3161	3.47		.00	
3162	3.54		.00	
3163	.00		.00	
3164	.00		.00	
3165	.00		.00	
3166	.00		.00	
3167	.00		.00	
3168	6.46		.00	
3169	9.74		8.40	
3170	9.43		.00	
3171	.17		.00	
3172	11.54		.00	
3173	*3603 608	.00	*1314 608	10.38
3174	.00		5.78	
3175	.00		3.44	
3176	192.00		.00	
3177	.00		.00	
3178	.00		.00	
3179	.00		10.09	
3180	.00		.00	
3181	272.00		.00	
3182	.00		.00	
3183	.00		.00	
3184	.00		.00	
3185	.00		.00	
3186	*0174 308	.00	*5002 608	.00
3187	.00		.00	
3188	.00		.00	
3189	9.98		.00	
3190	.00		.00	
3191	.00		.00	
3192	.00		.85	
3193	.00		.00	
3194	.00		.00	
3195	.00		.00	
3196	.00		.00	
3197	.00		2.63	

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3198	11.63		.00	
3199	*0133 606	.00	*0133 618	.00
3200	.00		.00	
3201	.00		.00	
3202	.00		.00	
3203	.00		.00	
3204	.00		.00	
3205	.00		2.33	
3206	.00		.00	
3207	.18		6.70	
3208	.00		.00	
3209	.00		.00	
3210	.00		4.75	
3211	.00		.00	
3212	*0133 300	.00	*1756 308	.00
3213	.00		.00	
3214	.00		.00	
3215	.00		.00	
3216	.00		.00	
3217	.00		.00	
3218	.00		.00	
3219	.00		.00	
3220	.00		.00	
3221	.00		12.13	
3222	8.75		.00	
3223	10.00		20.03	
3224	.00		32.45	
3225	*0318 300	.00	*3227 608	27.35
3226	9.48		.00	
3227	8.15		.00	
3228	.00		.00	
3229	.00		.00	
3230	.00		.00	
3231	.00		.00	
3232	8.43		.00	
3233	11.03		.00	
3234	8.48		.00	
3235	.00		16.45	
3236	.00		.00	
3237	.00		.00	
3238	*2738 606	.00	*2738 600	.00
3239	.00		11.39	
3240	.00		.00	
3241	.00		4.08	
3242	31.55		1.23	
3243	.00		.00	
3244	.00		.00	
3245	.00		9.42	
3246	.00		25.18	
3247	.00		13.97	
3248	.00		1.23	
3249	.00		.00	
3250	.00		.00	
3251	*2738 400	.00	*0335 608	1.48
3252	.00		.00	
3253	.00		.00	
3254	.00		.00	
3255	.05		.00	
3256	.00		.00	
3257	.00		.00	
3258	11.12		.00	
3259	.00		.00	
3260	.00		.00	
3261	.05		.00	
3262	.00		.00	
3263	.00		.00	
3264	*3202 610	.00	*1963 300	.00
3265	.00		.00	
3266	.00		.00	
3267	7.60		.00	
3268	17.66		.00	
3269	.00		.00	
3270	5.63		.00	
3271	16.28		.00	
3272	9.60		.00	
3273	.00		.00	
3274	2.45		14.65	
3275	.00		29.64	
3276	31.58		.00	
3277	*2750 618	.00	*1201 610	.00
3278	.00		.00	
3279	.00		.00	

Figure F-4. Winters Forecasts
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3280	.00		.00	
3281	.00		.00	
3282	.00		.00	
3283	.00		22.50	
3284	8.78		19.60	
3285	.00		.00	
3286	.90		.00	
3287	70.00		.00	
3288	15.63		.00	
3289	32.78		.00	
3290	*0229 618	.00	*5125 808	.00
3291	.40		67.28	
3292	.00		.00	
3293	.00		.00	
3294	.00		.00	
3295	.00		.00	
3296	4.90		.00	
3297	.00		.00	
3298	.00		.00	
3299	.00		.00	
3300	.00		.00	
3301	.00		.00	
3302	.00		.00	
3303	*0112 600	2.49	*5133 613	.00
3304	.00		.00	
3305	.00		14.00	
3306	.00		14.90	
3307	.00		.00	
3308	.00		.00	
3309	.37		.00	
3310	4.29		.00	
3311	.22		.00	
3312	.00		.00	
3313	.00		.00	
3314	.22		.00	
3315	.00		.00	
3316	*2739 805	.00	*2739 608	.00
3317	14.33		2.88	
3318	.00		.00	
3319	.00		.00	
3320	.00		7.23	
3321	.00		.00	
3322	.00		.00	
3323	.00		.00	
3324	.00		.00	
3325	.00		.00	
3326	.00		.00	
3327	.00		.00	
3328	.00		.00	
3329	*2929 603	.00		
3330	.00			
3331	.00			
3332	.00			
3333	.00			
3334	1.59			
3335	.00			
3336	2.45			
3337	.00			
3338	.98			
3339	.00			
3340	.00			
3341	1.08			

Figure F-4. Winters Forecasts
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APPENDIX G

WINTERS SOFTWARE

G-1. GENERAL. This appendix presents the symbolic code for the Winters main program (WINTERDRV5) and the Winters subroutine (WINTER5). The digit "5" is appended to each of these names only because it happened to be the fifth developmental version that was actually used for production. It should also be noted that the executable program created from the symbolic elements is referred to simply as WINTERDRV, without the "5" appended.

G-2. SOFTWARE LISTINGS

a. WINTERDRV5. The main program, WINTERDRV5, reads in certain model control parameters, graph titles and axes labels, and specific routes to be included in or excluded from the forecasting phase. For example, the runstream WINRUN050/TWFI is used to develop forecasts for routes 46 through 50 of the element ROUTES/LIST (Appendix D). The runstream itself is among those appearing in the second file of the methodology transfer tape (Appendix K). The inputs to WINTERDRV5 are as follows:

```
Line  1:  1 1 12 12
Line  2:  .00 .05 1.00 .00 .05 1.00 .00 .05 1.00
Line  3:  1 0.5 1.0
Line  4:  34 28 31
Line  5:  WINTERS' MODEL FOR ROUTE-COMMODITY
Line  6:  FISCAL YEAR 1984 (MONTHS)
Line  7:  CARGO SHIPPED PER MONTH IN TONS
Line  8:  46 50
Line  9:  @ADD,P G4TWFI.ROUTES/LIST
Line 10:  30
Line 11:  @ADD,P G4TWFI.ROUTES/OMIT
Line 12:  36
Line 13:  @ADD,P G4TWFI.ROUTES/INCLUDE
```

A copy of the WINTERDRV5 code appears in Figure G-1.

(1) Line 1 contains the following inputs:

(a) KSINP is 0 if the smoothing constants are specified by the user; 1 if smoothing constant optimization is desired.

(b) KNINP is 0 if the initial values of the model parameters are specified by the user; 1 if the initial values of the model parameters are estimated from the data.

(c) LINP is the length of the season.

(d) LTINP is the forecast lead time.

```
UNCLASSIFIED*G4TWFI(1).WINTERPRV5(50)
      DIMENSION YRMO(100),IOBS(100),TIME(100),WT(100),FFP(100)
      DIMENSION ROUTE(409),ROUTEO(30),ROUTEI(36)
      DIMENSION NCOMO(30),COMO(30,16),NCOMI(36),COMI(36,5)
      COMMON /SEASON/KSINP,KNINP,LINP,LTINP
      COMMON /SMOOTH/ALWR,ADLT,AUPR,BLWR,BDLT,BUPR,GLWR,GDLT,GUPR
      COMMON /PARAM/ADINP,BDINP,SINP(24)
      COMMON /XAXIS/IOPT,XZERO,DELTAX
      COMMON /LENGTH/NTITLE,NXLABL,NYLABL
      COMMON /LABELS/ITITLE,IXLABL,IYLABL
C
      INTEGER YRMO,YRMOI,YRMOF,YRMOP,YRI,YRF,YRP,DELYR,TIME
      CHARACTER STAR*1,POEPOD*4,COMMOD*3
      CHARACTER ITITRD*74,ITITAD*8
      CHARACTER ITITLE*43,IXLABL*28,IYLABL*71
      CHARACTER*4 ROUTE,ROUTEO,ROUTEI
      CHARACTER*3 COMO,COMI
C
      DATA NTITAD,MAXMTH/8,53/
C
   10 FORMAT(1X,A72/1X,A36/1X,A36)
   15 FORMAT(16(1X,A4))
   20 FORMAT(1X,A4,1X,I2)
   25 FORMAT(20(1X,A3))
   30 FORMAT(A1,A4,1X,A3,2(1X,I2))
   35 FORMAT(1X,I4,F10.2)
   36 FORMAT(4X,'NUMBER',6X,'YRMO',2X,'OBSERVED',1X,'PREDICTED')
   37 FORMAT(2I10,2F10.2)
   38 FORMAT(/5X,'NRMS',17X,'RMS')
   39 FORMAT(I10,10X,F10.2/1H1)
   40 FORMAT(/2X,'ROUTE ',A4,', COMMODITY ',A3,' SKIPPED -- ',
     +          'ONLY ONE DATA VALUE IN DATA BASE')
   45 FORMAT(/2X,'ROUTE ',A4,', COMMODITY ',A3,' SKIPPED -- ',
     +          'ONLY ',I2,' DATA VALUES UP THROUGH 8409')
   50 FORMAT(/2X,'ROUTE ',A4,', COMMODITY ',A3,' SKIPPED -- ',
     +          I2,' ZEROS APPENDED TO FILL OUT FY 1984')
   55 FORMAT(/2X,'ROUTE ',A4,', COMMODITY ',A3,' SKIPPED -- ',
     +          'AT LEAST 12 CONSEC ZEROS IN A PREV YEAR'/
     +       39X,'AND NEITHER 2 CONSEC NONZEROS NOR 3 NONCONSEC ',
     +          'NONZEROS DURING FINAL YEAR')
   60 FORMAT(/2X,'LAST YEAR ACTUALS USED FOR ',
     +          'ROUTE ',A4,', COMMODITY ',A3,' -- ',
     +          'AT LEAST 12 CONSEC ZEROS IN A PREV YEAR'/
     +       58X,'BUT EITHER 2 CONSEC NONZEROS OR 3 NONCONSEC ',
     +          'NONZEROS DURING FINAL YEAR')
   65 FORMAT(/2X,'LAST YEAR ACTUALS USED FOR ',
     +          'ROUTE ',A4,', COMMODITY ',A3,' -- ',
     +          'NO OCCURRENCE OF 12 CONSEC ZEROS IN A PREV YEAR'/
     +       58X,'BUT NEITHER 2 CONSEC NONZEROS NOR 3 NONCONSEC ',
     +          'NONZEROS DURING FINAL YEAR')
   70 FORMAT(/2X,'LAST YEAR ACTUALS USED FOR ',
     +          'ROUTE ',A4,', COMMODITY ',A3,' -- ',
     +          'NO OCCURRENCE OF 12 CONSEC ZEROS IN A PREV YEAR'/
     +       58X,'AND EITHER 2 CONSEC NONZEROS OR 3 NONCONSEC ',
     +          'NONZEROS DURING FINAL YEAR'/
     +       58X,'BUT ONLY ',I2,' DATA VALUES INSUFFICIENT FOR ',
     +          'WINTERS FORECAST')
   75 FORMAT(/2X,'WINTERS FORECAST PERFORMED FOR ',
     +          'ROUTE ',A4,', COMMODITY ',A3,' -- ',
     +          'NO OCCURRENCE OF 12 CONSEC ZEROS IN A PREV YEAR'/
     +       62X,'AND EITHER 2 CONSEC NONZEROS OR 3 NONCONSEC ',
     +          'NONZEROS DURING FINAL YEAR'/
     +       62X,'AND ',I2,' DATA VALUES SUFFICIENT FOR ',
     +          'WINTERS FORECAST')
   80 FORMAT(A1,A4,1X,A3,1X,F10.2)
   85 FORMAT(F10.2)
C
      READ *, KSINP,KNINP,LINP,LTINP
      IF (KSINP .EQ. 0) THEN
         READ *, ALPHA,BETA,GAMMA
      ELSE IF (KSINP .EQ. 1) THEN
         READ *, ALWR,ADLT,AUPR,BLWR,BDLT,BUPR,GLWR,GDLT,GUPR
      ENDIF
      IF (KNINP .EQ. 0) THEN
         READ *, ADINP,BDINP
         READ *, (SINP(I),I=1,LINP)
      ENDIF
      READ *, IOPT,XZERO,DELTAX
      READ *, NTITRD,NXLABL,NYLABL
      READ(5,10) ITITRD,IXLABL,IYLABL
      READ *, NRTMIN,NRTMAX
      READ(5,15) (ROUTE(I),I=1,409)
```

Figure G-1. Winters Main Program
(page 1 of 4 pages)

```
      READ *,NOMIT
      DO 100 I=1,NOMIT
         READ(5,20) ROUTEO(I),NCOMO(I)
         READ(5,25) (COMO(I,J),J=1,NCOMO(I))
  100 CONTINUE
      READ *,NINCL
      DO 110 I=1,NINCL
         READ(5,20) ROUTEI(I),NCOMI(I)
         READ(5,25) (COMI(I,J),J=1,NCOMI(I))
  110 CONTINUE
C
      NTITLE=NTITRD+1+NTITAD
C
      KSWICH=0
      DO 200 KROUTE=NRTMIN,NRTMAX
  300    READ(2,30,END=999) STAR,POEPOD,COMMOD,NRANGE,NNZERO
         IF (STAR .NE. '*') GO TO 300
         IF (POEPOD .NE. ROUTE(KROUTE)) THEN
            IF (KSWICH .EQ. 0) THEN
               GO TO 300
            ELSE
               GO TO 200
            ENDIF
         ELSE
            KSWICH=1
         ENDIF
C
         IF (NRANGE .EQ. 1) THEN
            PRINT 40,POEPOD,COMMOD
            GO TO 300
         ENDIF
C
         READ(2,35) (YRMO(I),TONS(I),I=1,NRANGE)
C
         IF (KROUTE .LE. 30) THEN
            KWINT=1
            DO 400 I=1,NOMIT
               IF (POEPOD .EQ. ROUTEO(I)) THEN
                  IROUTE=I
                  DO 410 J=1,NCOMO(IROUTE)
                     IF (COMMOD .EQ. COMO(IROUTE,J)) THEN
                        GO TO 300
                     ENDIF
  410             CONTINUE
               ENDIF
  400       CONTINUE
         ELSE
            KWINT=0
         ENDIF
C
         YRMOI=YRMO(1)
         YRMOF=8409
         YRI=YRMOI/100
         YRF=YRMOF/100
         DELYR=YRF-YRI
         MOI=YRMOI-100*YRI
         MOF=YRMOF-100*YRF
         NMOYRI=12-MOI+1
         NMOYRF=   MOF
         IF (DELYR .EQ. 0) THEN
            NFINAL=MOF-MOI+1
         ELSE IF (DELYR .EQ. 1) THEN
            NFINAL=NMOYRI+NMOYRF
         ELSE IF (DELYR .GE. 2) THEN
            NMOBET=12*(DELYR-1)
            NFINAL=NMOYRI+NMOBET+NMOYRF
         ENDIF
C
         IF (NFINAL .LT. 24) THEN
            PRINT 45,POEPOD,COMMOD,NFINAL
            GO TO 300
         ENDIF
C
         NADDFD=NFINAL-NRANGE
         IF (NADDED .GE. 12) THEN
            PRINT 50,POEPOD,COMMOD,NADDED
            GO TO 300
         ENDIF
C
         YRP=YRI
         DO 500 I=1,NFINAL
            MOP=MOD(MOI+I-2,12)+1
```

Figure G-1. Winters Main Program
(page 2 of 4 pages)

```
               IF (I .GT. 1  .AND.  MOP .EQ. 1) THEN
                  YRP=YRP+1
               ENDIF
               YRMOP=100*YRP+MOP
               IF (I .LE. NRANGE) THEN
                  TIME(I)=YRMO(I)
                  WT(I)=TONS(I)
               ELSE
                  TIME(I)=YRMOP
                  WT(I)=0.0
               ENDIF
  500       CONTINUE
C
            IF (NFINAL .GT. MAXMTH) THEN
               LOST=NFINAL-MAXMTH
               NINITL=MAXMTH
            ELSE
               LOST=MOD(NFINAL,LINP)
               NYEAR=NFINAL/LINP
               NINITL=NYEAR*LINP
            ENDIF
            NTOTAL=NINITL+LINP
            DO 600 I=1,NTOTAL
               IF (I .LE. NINITL) THEN
                  TIME(I)=TIME(I+LOST)
                  WT(I)=WT(I+LOST)
               ELSE
                  TIME(I)=0
                  WT(I)=0.0
               ENDIF
  600       CONTINUE
C
            ICON12=0
            NPRVYR=NINITL-12
            DO 700 I=1,NPRVYR
               IF (WT(I) .EQ. 0.0) THEN
                  ICON12=ICON12+1
                  IF (ICON12 .EQ. 12) THEN
                     GO TO 710
                  ENDIF
               ELSE
                  ICON12=0
               ENDIF
  700       CONTINUE
C
  710       INZERO=0
            ICON2=0
            NPYRP1=NPRVYR+1
            DO 720 I=NPYRP1,NINITL
               IF (WT(I) .GT. 0.0) THEN
                  INZERO=INZERO+1
                  ICON2=ICON2+1
                  IF (ICON2 .EQ. 2) THEN
                     GO TO 730
                  ENDIF
               ELSE
                  ICON2=0
               ENDIF
  720       CONTINUE
C
  730       IBRNCH=0
            IF (INZERO .GE. 3  .OR.  ICON2 .EQ. 2) THEN
               IBRNCH=1
            ENDIF
C
            ITITAD=POEPOD//' '//COMMOD
            ITITLE=ITITRD//' '//ITITAD
C
            NSTART=1+LINP
            NRMS=NINITL-NSTART+1
            NITP1=NINITL+1
            RMS=0.0
            IF (ICON12 .EQ. 12) THEN
               IF (IBRNCH .EQ. 0) THEN
                  PRINT 55,POEPOD,COMMOD
                  GO TO 300
               ELSE
                  PRINT 50,POEPOD,COMMOD
                  WRITE(11,80) STAF,POEPOD,COMMOD,RMS
                  WRITE(11,85) (WT(I),I=NPYRP1,NINITL)
                  GO TO 300
               ENDIF
```

Figure G-1. Winters Main Program
(page 3 of 4 pages)

```
            ELSE
               IF (IBRNCH .EQ. 0) THEN
                  PRINT 65,POEPOD,COMMOD
                  WRITE(11,80) STAR,POEPOD,COMMOD,RMS
                  WRITE(11,85) (WT(I),I=NPYRP1,NINITL)
                  GO TO 300
               ELSE
                  IF (NINITL .LT. 36) THEN
                     PRINT 70,POEPOD,COMMOD,NINITL
                     WRITE(11,80) STAR,POEPOD,COMMOD,RMS
                     WRITE(11,85) (WT(I),I=NPYRP1,NINITL)
                     GO TO 300
                  ELSE
                     PRINT 75,POEPOD,COMMOD,NINITL
                     CALL WINTER(NTOTAL,NINITL,WT,FFP)
                     SUMSQ=0.0
                     DO 740 I=NSTART,NINITL
                        RES=FFP(I)-WT(I)
                        SUMSQ=SUMSQ+RES**2
      740            CONTINUE
                     RMS=SQRT(SUMSQ/NRMS)
                     WRITE(11,80) STAR,POEPOD,COMMOD,RMS
                     DO 750 I=NITP1,NTOTAL
                        IF (FFP(I) .LT. 0.0) THEN
                           FFP(I)=0.0
                        ENDIF
      750            CONTINUE
                     WRITE(11,85) (FFP(I),I=NITP1,NTOTAL)
                     PRINT 36
                     PRINT 37,(I,TIME(I),WT(I),FFP(I),I=1,NTOTAL)
                     PRINT 38
                     PRINT 39,NRMS,RMS
                     GO TO 300
                  ENDIF
               ENDIF
            ENDIF
      200 CONTINUE
C
      999 STOP
          END
```

Figure G-1. Winters Main Program
(page 4 of 4 pages)

(2) Line 2 contains three sets of triplets used to perform the initial coarse search for the optimum smoothing constants; subsequently, the program automatically performed a fine search.

(a) The first triplet specifies the lower limit, step size, and upper limit for alpha.

(b) The second triplet specifies the lower limit, step size, and upper limit for beta.

(c) The third triplet specifies the lower limit, step size, and upper limit for gamma.

(3) Line 3 contains constants used in conjunction with the IMSL plot routine USPLO:

(a) IOPT is 0 if an 80-column printer plot is desired; 1 if a 129-column plot is preferred.

(b) XZERO is the location of the first value of the independent variable; 0.5 specifies the midpoint of the first month.

(c) DELTAX is used to define the rest of the independent variables; 1.0 means spacing 1 month apart.

(4) Line 4 contains the number of characters in the labels appearing at lines 5, 6, and 7, respectively.

(5) Line 5 contains the generic heading for each printer plot; it is concatenated with a specific route-commodity-mode combination.

(6) Line 6 contains the abscissa label for each printer plot.

(7) Line 7 contains the ordinate label for each printer plot.

(8) Line 8 contains indices of the specific routes to be fit with the Winters Model; 46 50 means routes 46 through 50 from the array ROUTES/LIST (Appendix D).

(9) Line 9 inserts all 409 routes from the array ROUTES/LIST.

(10) Line 10 contains the number of routes to be omitted from the analysis.

(11) Line 11 inserts the routes to be omitted from the array ROUTES/OMIT.

(12) Line 12 contains the number of special routes to be included in the analysis.

(13) Line 13 inserts the special routes to be included from the array ROUTES/INCLUDE. (It should be noted that the logic intended to be used in conjunction with lines 12 and 13 was never developed, since it was decided to include **all** routes in the study.)

b. WINTER5. The Winters Model WINTER5 is called by the main program WINTERDRV5. The Winters methodology has been described in Chapter 2 of this study. A copy of the WINTER5 code appears in Figure G-2.

```
UNCLASSIFIED*G4T&FI(1).WINTERS(56)
      SUBROUTINE WINTER(N,N1,X,FFP)
      DIMENSION AVAL(41),BVAL(41),GVAL(41),FVAL(41),NVAL(41)
      DIMENSION X(N),A(100),B(100),S(24),V(10),FF(10,24),R(100),F(100)
      DIMENSION FFP(N),SAVE(24),SS(100)
      DIMENSION XPLT(100),YPLT(100,2),RANGE(4)
      COMMON /SEASON/KSINP,KNINP,LINP,LTINP
      COMMON /SMOOTH/ALWR,ADLT,AUPR,BLWR,BDLT,BUPR,GLWR,GDLT,GUPR
      COMMON /PARAM/A0INP,B0INP,SINP(24)
      COMMON /XAXIS/IOPT,XZERO,DELTAX
      COMMON /LENGTH/NTITLE,NXLABL,NYLABL
      COMMON /LABELS/ITITLE,IXLABL,IYLABL
C
      REAL ONEMAA,ONEMBB,ONEMGG
      CHARACTER ITITLE*43,IXLABL*28,IYLABL*71
      CHARACTER ICHAR*2
      DATA ICHAR/'UP'/
C
C
C     WINTERS' METHOD -- ADDITIVE TREND AND MULTIPLICATIVE SEASONALS
C
C     F(I) IS THE FORECAST MADE IN PERIOD I
C     FFP(I) IS THE FORECAST MADE FOR PERIOD I
C     X(I) IS THE DATA WHICH IS RECEIVED IN PERIOD I
C     R(I) IS X(I)-FFP(I)
C
      KS=KSINP
      KN=KNINP
      L=LINP
      LT=LTINP
      XLT=LT
      XMAX=0.0
      DO 700 I=1,N1
         IF (X(I) .EQ. 0.0) THEN
            DO 710 J=1,N1
               XMAX=AMAX1(XMAX,X(J))
  710       CONTINUE
            DO 720 J=1,N1
               X(J)=X(J)+XMAX
  720       CONTINUE
            GO TO 730
         ENDIF
  700 CONTINUE
  730 CONTINUE
      WRITE(6,5)
    5 FORMAT(1H1,25X,'WINTERS METHOD FOR FORECASTING A SEASONAL',
     + ' TIME SERIES'/)
      IF (KN .EQ. 1) GO TO 12
      WRITE(6,6)
    6 FORMAT(1H0,10X,'INITIAL VALUES OF THE PERMANENT, TREND',
     + ' AND SEASONAL COMPONENTS SPECIFIED')
      A0=A0INP
      B0=B0INP
      DO 7 I=1,L
      S(I)=SINP(I)
    7 SAVE(I)=S(I)
      WRITE(6,8) A0
    8 FORMAT(1H0,20X,'INITIAL PERMANENT COMPONENT = ',F10.4)
      WRITE(6,9) B0
    9 FORMAT(1H0,20X,'INITIAL TREND COMPONENT = ',F10.4)
      DO 10 I=1,L
   10 WRITE(6,11) I,S(I)
   11 FORMAT(1H0,20X,'INITIAL SEASONAL FACTOR FOR PERIOD ',I3,
     + ' = ',F10.4)
      GO TO 22
   12 WRITE(6,13)
   13 FORMAT(1H0,10X,'INITIAL VALUES OF THE PERMANENT, TREND',
     + ' AND SEASONAL COMPONENTS TO BE ESTIMATED FROM THE DATA.')
      KK=N1/L
      WRITE(6,14) N1,KK
   14 FORMAT(1H0,10X,'THE FIRST ',I3,' PERIODS OF DATA WHICH',
     + ' CORRESPOND TO ',I3,' SEASONS WILL BE USED')
      KCYCLE=0
      RL=L
      J1=1
      J2=L
      DO 16 I=1,KK
      V(I)=0.0
      DO 15 J=J1,J2
   15 V(I)=V(I)+X(J)
      V(I)=V(I)/RL
      J1=J2+1
```

Figure G-2. Winters Subroutine
(page 1 of 5 pages)

```
      J2=J1+L-1
   16 CONTINUE
      RR=N1-L
      B0=(V(KK)-V(1))/RR
      A0=V(1)-RL/2.0*B0
      J1=0
      DO 18 I=1,KK
      DO 17 J=1,L
      JT=J+J1*L
      RJ=J
   17 FF(I,J)=X(JT)/(V(I)-(((RL+1.0)/2.0)-RJ)*B0)
      J1=J1+1
   18 CONTINUE
      SUMS=0.0
      RKK=KK
      DO 20 J=1,L
      SUM=0.0
      DO 19 I=1,KK
   19 SUM=SUM+FF(I,J)
      S(J)=SUM/RKK
   20 SUMS=SUMS+S(J)
      WRITE(6,8) A0
      WRITE(6,9) B0
      DO 21 J=1,L
      S(J)=S(J)*RL/SUMS
      SAVE(J)=S(J)
   21 WRITE(6,11) J,S(J)
   22 IF (KS .EQ. 0) GO TO 32
  100 KCYCLE=KCYCLE+1
      WRITE(6,23)
   23 FORMAT(1H1,10X,'SMOOTHING CONSTANT OPTIMIZATION ROUTINE')
      WRITE(6,24)
   24 FORMAT(1H0,10X,'ALPHA',10X,'BETA',10X,'GAMMA',10X,
     + 'RESIDUAL SUM OF SQUARES'/)
C
C     SEARCH FOR OPTIMUM VALUES
C
      ICOUNT=0
      IF (KCYCLE .EQ. 1) THEN
         AL=ALWR
         AD=ADLT
         AU=AUPR
         BL=BLWR
         BD=BDLT
         BU=BUPR
         GL=GLWR
         GD=GDLT
         GU=GUPR
      ELSE IF (KCYCLE .EQ. 2) THEN
         AL=ALPHA-AD
         AL=AMAX1(0.0,AL)
         AU=ALPHA+AD
         AU=AMIN1(1.0,AU)
         AD=0.01
         BL=BETA-AD
         BL=AMAX1(0.0,BL)
         BU=BETA+AD
         BU=AMIN1(1.0,BU)
         BD=0.01
         GL=GAMMA-GD
         GL=AMAX1(0.0,GL)
         GU=GAMMA+GD
         GU=AMIN1(1.0,GU)
         GD=0.01
      ENDIF
      KA=(AU-AL)/AD+1.0
      KB=(BU-BL)/BD+1.0
      KC=(GU-GL)/GD+1.0
      NITER=KA*KB*KC
      NPRINT=MIN0(40,NITER)
      NPRTP1=NPRINT+1
      AA=AL
      ABEST=0.0
      BBEST=0.0
      GBEST=0.0
      ERBEST=1.0E38
      DO 30 IT=1,KA
      ONEMAA=1.0-AA
      BB=BL
      DO 29 IJ=1,KB
      ONEMBB=1.0-BB
      GG=GL
```

Figure G-2. Winters Subroutine
(page 2 of 5 pages)

```
      DO 28 IK=1,KG
      ICOUNT=ICOUNT+1
      DO 205 IL=1,L
  205 S(IL)=SAVE(IL)
      ONEMGG=1.0-GG
      A(1)=AA*(X(1)/S(1))+ONEMAA*(A0+B0)
      B(1)=BB*(A(1)-A0)+ONEMBB*B0
      S(1)=GG*(X(1)/A(1))+ONEMGG*S(1)
      XHAT=(A(1)+XLT*B(1))*S(1)   @ ARGUMENT OF S CHANGED FROM 'I+LT'
      E=(X(1+LT)-XHAT)**2
      DO 26 I=2,N1
      IL=MOD(I,L)
      IF (IL .EQ. 0) IL=L
   25 A(I)=AA*(X(I)/S(IL))+ONEMAA*(A(I-1)+B(I-1))
      B(I)=BB*(A(I)-A(I-1))+ONEMBB*B(I-1)
      S(IL)=GG*(X(I)/A(I))+ONEMGG*S(IL)
      ILLT=IL+LT
      IF (ILLT .GT. L) ILLT=ILLT-L
      XHAT=(A(I)+XLT*B(I))*S(ILLT)
   26 E=E+(X(I+LT)-XHAT)**2
      IF (ICOUNT .LT. NPRINT) THEN
         AVAL(ICOUNT)=AA
         BVAL(ICOUNT)=BB
         GVAL(ICOUNT)=GG
         EVAL(ICOUNT)=E
         NVAL(ICOUNT)=ICOUNT
      ELSE IF (ICOUNT .EQ. NPRINT) THEN
         AVAL(NPRINT)=AA
         BVAL(NPRINT)=BB
         GVAL(NPRINT)=GG
         EVAL(NPRINT)=E
         NVAL(NPRINT)=NPRINT
         CALL ORDERA(NPRINT,AVAL,BVAL,GVAL,EVAL,NVAL)
      ELSE IF (E .LE. EVAL(NPRINT)) THEN
         AVAL(NPRINT+1)=AA
         BVAL(NPRINT+1)=BB
         GVAL(NPRINT+1)=GG
         EVAL(NPRINT+1)=E
         NVAL(NPRINT+1)=ICOUNT
         CALL ORDERA(NPRIP1,AVAL,BVAL,GVAL,EVAL,NVAL)
      ENDIF
      IF (E .GE. EBEST) GO TO 28
      ALPHA=AA
      BETA=BB
      GAMMA=GG
      EBEST=E
   28 GG=GG+GD
   29 BB=BB+BD
   30 AA=AA+AD
      DO 500 KP=1,NPRINT
      WRITE(6,27) AVAL(KP),BVAL(KP),GVAL(KP),EVAL(KP)
   27 FORMAT(8X,F10.4,2(5X,F10.4),15X,E15.7)
  500 CONTINUE
      WRITE(6,31)
   31 FORMAT(1H0,10X,'THE OPTIMUM SMOOTHING CONSTANTS ARE')
   32 IF (KS .EQ. 0) WRITE(6,33)
   33 FORMAT(1H0,10X,'THE SMOOTHING CONSTANTS ARE SPECIFIED AS')
      WRITE(6,34) ALPHA,BETA,GAMMA
   34 FORMAT(1H0,10X,'ALPHA = ',F10.4,5X,'BETA = ',F10.4,
     + 5X,'GAMMA = ',F10.4)
      IF (KCYCLE .LT. 2  .AND.  KS .EQ. 1) GO TO 100
      IF (N1 .EQ. 0) N1=L
C
C     FORECAST WITH OPTIMUM SMOOTHING CONSTANTS
C
      DO 305 IL=1,L
  305 S(IL)=SAVE(IL)
      ONEMAA=1.0-ALPHA
      ONEMBB=1.0-BETA
      ONEMGG=1.0-GAMMA
      A(1)=ALPHA*(X(1)/S(1))+ONEMAA*(A0+B0)
      B(1)=BETA*(A(1)-A0)+ONEMBB*B0
      S(1)=GAMMA*(X(1)/A(1))+ONEMGG*S(1)
      F(1)=(A(1)+XLT*B(1))*S(1)   @ ARGUMENT OF S CHANGED FROM 'I+LT'
      SS(1)=S(1)
      FFP(1+LT)=F(1)
      R(1+LT)=X(1+LT)-F(1)
      SUM=R(1)
      SUMSQ=R(1)**2
      XMAD=ABS(R(1))
      DO 36 I=2,N1
      IL=MOD(I,L)
```

Figure G-2. Winters Subroutine
(page 3 of 5 pages)

```
      IF (IL .EQ. 0) IL=L
   35 A(I)=ALPHA*(X(I)/S(IL))+ONEMAA*(A(I-1)+B(I-1))
      B(I)=BETA*(A(I)-A(I-1))+ONEMBB*B(I-1)
      S(IL)=GAMMA*(X(I)/A(I))+ONEMGG*S(IL)
      SS(I)=S(IL)
      ILLT=IL+LT
      IF (ILLT .GT. L) ILLT=ILLT-L
      F(I)=(A(I)+XLT*B(I))*S(ILLT)
      FFP(I+LT)=F(I)
      R(I+LT)=X(I+LT)-F(I)
      SUM=SUM+R(I)
      XMAD=XMAD+ABS(R(I))
   36 SUMSQ=SUMSQ+R(I)**2
      DO 306 I=1,LT
      R(I)=0.0
  306 FFP(I)=0.0
      J=N1+1
      SUME=0.0
      SUME2=0.0
C
C     START THE FORECASTING PHASE
C
      DO 38 I=J,N
      IL=MOD(I,L)
      IF (IL .LE. 0) IL=L
   37 FFP(I)=(A(I-LT)+XLT*B(I-LT))*S(IL)
      A(I)=ALPHA*(X(I)/S(IL))+ONEMAA*(A(I-1)+B(I-1))
      B(I)=BETA*(A(I)-A(I-1))+ONEMBB*B(I-1)
      S(IL)=GAMMA*(X(I)/A(I))+ONEMGG*S(IL)
      SS(I)=S(IL)
      R(I)=X(I)-FFP(I)
      SUME=SUME+R(I)
   38 SUME2=SUME2+R(I)**2
      WRITE(6,39)
   39 FORMAT(1H1,50X,'OUTPUT OF THE INITIALIZATION PHASE'//)
      WRITE(6,40)
   40 FORMAT(1H0,10X,'PERIOD',5X,'OBSERVATION',5X,
     + 'PERMANENT COMPONENT',2X,'TREND',7X,'SEASONAL FACTOR',5X,
     + 'FITTED MODEL',4X,'RESIDUAL'/)
      DO 750 I=1,N
         IF (I .LE. N1) X(I)=X(I)-XMAX
         IF (I .GE. 1+LT) FFP(I)=FFP(I)-XMAX
  750 CONTINUE
      DO 41 I=1,N1
   41 WRITE(6,42) I,X(I),A(I),B(I),SS(I),FFP(I),R(I)
   42 FORMAT(12X,I3,6X,F10.2,11X,F10.4,4X,F10.4,
     + 7X,F10.4,7X,F10.2,5X,F10.2)
      T=N1
      AVE=SUM/T
      VAR=(SUMSQ-T*AVE**2)/(T-1.0)
      STD=SQRT(VAR)
      XMAD=XMAD/T
      WRITE(6,43) SUM,AVE,VAR,STD
   43 FORMAT(1H0,5X,'SUM OF RESIDUALS = ',F10.2,5X,'AVERAGE',
     + ' RESIDUAL = ',F10.2,5X,'VARIANCE = ',F10.2,5X,'STANDARD',
     + ' DEVIATION = ',F10.2)
      WRITE(6,3) XMAD
    3 FORMAT(1H0,5X,'MEAN ABSOLUTE DEVIATION = ',F10.2)
      KTR=0
      STDM=STD*(-2.0)
      STD=2.0*STD
      DO 44 I=1,N1
      IF (R(I) .GT. STD  .OR.  R(I) .LT. STDM) KTR=KTR+1
   44 CONTINUE
      WRITE(6,45) KTR
   45 FORMAT(1H0,5X,'NUMBER OF RESIDUALS EXCEEDING TWO',
     + ' STANDARD DEVIATIONS = ',I3)
      WRITE(6,46)
   46 FORMAT(1H1,50X,'OUTPUT OF FORECASTING PHASE'//)
      WRITE(6,47) L,LT
   47 FORMAT(1H0,40X,'LENGTH OF THE SEASON IS ',I3,' PERIODS',
     + 5X,'FORECAST LEAD TIME IS ',I3,' PERIODS')
      WRITE(6,48)
   48 FORMAT(1H0,'PERIOD',5X,'OBSERVATION',5X,'PERMANENT COMPONENT',
     + 5X,'TREND',5X,'SEASONAL FACTOR',5X,'FORECAST',5X,'ERROR',
     + 10X,'TRACKING SIGNALS')
      WRITE(6,49)
   49 FORMAT(134X,'CUM. ERROR',2X,'SMOOTHED ERROR')
      Y=0.0
      Z=0.0
      SUMO=0.0
      DO 51 I=J,N
```

Figure G-2. Winters Subroutine
(page 4 of 5 pages)

```
   50 Y=Y+R(I)
      Z=0.1*R(I)+0.9*Z
      XMAD=0.1*ABS(R(I))+0.9*XMAD
      TC=Y/XMAD
      TS=Z/XMAD
      SUMO=SUMO+X(I)
   51 WRITE(6,52) I,X(I),A(I),B(I),SS(I),FFP(I),R(I),TC,TS
   52 FORMAT(3X,I3,5X,F10.2,11X,F10.4,5X,F10.4,7X,F10.4,5X,F10.2,2X,
     + F10.2,1X,F10.4,2X,F10.4)
      XN=N-N1
      AVG=SUME/XN
      VAR=(SUME2-XN*AVG**2)/(XN-1.0)
      STD=SQRT(VAR)
      RMS=SQRT(SUME2/XN)
      AVGO=SUMO/XN
      WRITE(6,53) SUME,AVG,VAR,STD
   53 FORMAT(1H0,'SUM OF FORECAST ERRORS =',F10.2,5X,
     + 'MEAN FORECAST ERROR =',F10.2,5X,'VARIANCE =',
     + F10.2,5X,'STANDARD DEVIATION =',F10.2)
      WRITE(6,54) RMS,AVGO
   54 FORMAT(1H0,'ROOT MEAN SQUARE ERROR =',F10.2,
     + 5X,'MEAN OBSERVATION =',F10.2)
      IF (AVGO .GT. 0.0) THEN
        FRACM=AVG/AVGO
        FRACR=RMS/AVGO
        WRITE(6,55) FRACM,FRACR
   55   FORMAT(1H0,'MEAN ERROR AS FRACTION OF MEAN OBSERVATION =',F10.4,
     +  5X,'RMS ERROR AS FRACTION OF MEAN OBSERVATION =',F10.4)
      ENDIF
C
      NPLT=N-N1
      DO 600 I=1,NPLT
      XPLT(I)=XZERO+DELTAX*(I-1)
      YPLT(I,1)=X(N1-L+I)
      YPLT(I,2)=FFP(N1-L+I)
  600 CONTINUE
      RANGE(2)=XPLT(NPLT)
      CALL USPLO(XPLT,YPLT,100,NPLT,2,1,ITITLE,NTITLE,IXLABL,
     + NXLABL,IYLABL,NYLABL,RANGE,ICHAR,IOPT,IER)
      PRINT 99
   99 FORMAT(1H1)
      RETURN
      END
```

Figure G-2. Winters Subroutine
(page 5 of 5 pages)

APPENDIX H

BOX-JENKINS FORECASTS

H-1. For each route-commodity-mode (RCM) that was forecast, this appendix contains the time series for the RCM, the mathematical model developed from that series, and the forecast made using that model and time series.

H-2. Each RCM has a monthly history in tons which is called the time series. This series is the first item encountered for each RCM in this appendix. Generally, time series are 84 months long, beginning 10-77 and ending 9-84. However, due to major changes in the overall transportation program in FY 78 and FY 79, several RCMs had data during these 2 years which were inconsistent with the rest of the time series. When this was the case, a shortened time series was used which excluded the first several observations. Some data points were determined by analysis to be outliers. When this was the case, and the data was reevaluated by the sponsor, the change is noted at the end of the RCM. In order to simplify the usage of the data in the BMDP subroutines, all the tonnage values were divided by 1,000; the resulting value is the second column. If a log transformation was used, the natural log of the monthly tonnages is also included and is the third column for each RCM.

H-3. On the page following each time series, the first item encountered is the differencing equation used to make the time series stationary. The exponent(s) of B is/are the lag(s) used in the differencing process.

H-4. Following the differencing equation, the model that best characterizes the data series is defined. Each of the parameters of the model are individually defined by their type, factor, order, and estimated value. Each parameter also has an associated standard error value and t-ratio value. Next, the forecast made using the model is presented. The center column contains the monthly forecasts in thousands of tons; the column on the right contains the standard error of these forecasts. The final item for each RCM is the Box-Pierce statement of validity.

East Coast to Europe/Chill/Container

1.	10.	.010
2.	39.	.039
3.	26.	.026
4.	52.	.052
5.	0.	.000
6.	1.	.001
7.	116.	.116
8.	425.	.425
9.	496.	.496
10.	815.	.815
11.	542.	.542
12.	835.	.835
13.	148.	.148
14.	18.	.018
15.	7.	.007
16.	0.	.000
17.	1.	.001
18.	35.	.035
19.	344.	.344
20.	443.	.443
21.	412.	.412
22.	634.	.634
23.	866.	.856
24.	448.	.448
25.	33.	.033
26.	272.	.272
27.	1.	.001
28.	34.	.034
29.	71.	.071
30.	112.	.112
31.	259.	.259
32.	907.	.907
33.	367.	.357
34.	1238.	1.238
35.	772.	.772
36.	583.	.583
37.	57.	.057
38.	51.	.051
39.	26.	.026
40.	163.	.163
41.	64.	.054
42.	47.	.047
43.	442.	.442
44.	508.	.508
45.	334.	.334
46.	727.	.727
47.	926.	.926
48.	602.	.602
49.	41.	.041
50.	8.	.008
51.	24.	.025
52.	0.	.000
53.	13.	.013
54.	115.	.115
55.	695.	.695
56.	594.	.594
57.	462.	.462
58.	493.	.493
59.	716.	.716
60.	636.	.636
61.	15.	.015
62.	0.	.000
63.	1.	.001
64.	0.	.000
65.	0.	.000
66.	1.	.001
67.	658.	.658
68.	735.	.735
69.	406.	.406
70.	951.	.951
71.	872.	.872
72.	388.	.388
73.	142.	.142
74.	0.	.000
75.	10.	.010
76.	20.	.019
77.	2.	.002
78.	50.	.050
79.	470.	.470
80.	626.	.626
81.	302.	.302
82.	592.	.592
83.	961.	.951
84.	999.	.999

East Coast to Europe/Chill/Container

```
                    TIME      DIFFERENCES
                                  12
                    1-   84   (1-B   )

PARAMETER VARIABLE    TYPE   FACTOR   ORDER ESTIMATE        ST. ERR.   T-RATIO
    1    TRANS         MA      1        12     .8375          .0404      20.71


                FORECASTS
                85 10               .05121           .17357
                85 11               .04215           .17357
                85 12               .01650           .17357
                86  1               .03945           .17357
                86  2               .01357           .17357
                86  3               .03746           .17367
                86  4               .37126           .17357
                86  5               .56691           .17357
                86  6               .41678           .17357
                86  7               .77381           .17357
                86  8               .75137           .17357
                86  9               .65360           .17585

                SUM OF 12 FORECASTS =        3.73
```

The observed value for the Box-Pierce chi square is 20.78 with 23 degrees of freedom. This is not significant at the .05 level.

East Coast to Europe/Freeze/Container

1.	551.	.551
2.	636.	.636
3.	2345.	2.34[illegible]
4.	857.	.8[illegible]
5.	1052.	1.052
6.	1386.	1.386
7.	1601.	1.601
8.	1517.	1.517
9.	1326.	1.326
10.	1773.	1.773
11.	1422.	1.422
12.	1097.	1.097
13.	857.	.857
14.	1311.	1.311
15.	1265.	1.265
16.	1214.	1.214
17.	1355.	1.355
18.	1113.	1.113
19.	1566.	1.566
20.	1574.	1.574
21.	1319.	1.319
22.	1254.	1.254
23.	1559.	1.559
24.	553.	.553
25.	854.	.854
26.	1477.	1.477
27.	870.	.870
28.	1361.	1.361
29.	684.	.684
30.	1501.	1.501
31.	1452.	1.452
32.	1492.	1.492
33.	1471.	1.471
34.	1523.	1.523
35.	790.	.790
36.	832.	.832
37.	1161.	1.161
38.	1120.	1.120
39.	1179.	1.179
40.	960.	.960
41.	1361.	1.361
42.	1440.	1.440
43.	1385.	1.385
44.	2415.	2.415
45.	784.	.784
46.	936.	.936
47.	1498.	1.498
48.	732.	.732
49.	1714.	1.714
50.	955.	.955
51.	846.	.846
52.	1935.	1.935
53.	1308.	1.308
54.	1026.	1.026
55.	1688.	1.688
56.	1709.	1.709
57.	1103.	1.103
58.	1414.	1.414
59.	1113.	1.113
60.	1100.	1.100
61.	1448.	1.448
62.	1395.	1.395
63.	1507.	1.507
64.	1840.	1.840
65.	1479.	1.479
66.	1542.	1.542
67.	1605.	1.605
68.	2014.	2.014
69.	1229.	1.229
70.	1961.	1.961
71.	834.	.834
72.	892.	.892
73.	1278.	1.278
74.	1131.	1.131
75.	1454.	1.454
76.	1500.	1.500
77.	1009.	1.009
78.	1640.	1.640
79.	1748.	1.748
80.	2080.	2.080
81.	2016.	2.016
82.	1806.	1.806
83.	1491.	1.491
84.	1582.	1.582

East Coast to Europe/Freeze/Container

TIME DIFFERENCES

12

1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	-.7968	.1392	-5.72
2	TRANS	MA	2	3	-.3611	.1222	-2.95
3	TRANS	MA	3	5	-.3205	.1209	-2.65
4	TRANS	MA	4	11	-.2352	.1082	-2.17
5	TRANS	AR	1	1	-.9280	.0903	-10.28
6	TRANS	AR	2	12	-.2961	.1035	-2.86

FORECASTS

85	10	1.41380	.37892
85	11	1.58466	.38167
85	12	1.46449	.39289
86	1	1.62846	.39349
86	2	1.27370	.40609
86	3	1.65726	.40610
86	4	1.77688	.40611
86	5	2.21084	.40369
86	6	1.81259	.40877
86	7	1.99035	.40883
86	8	1.35981	.41688
86	9	1.08795	.49090

SUM OF 12 FORECASTS = 19.26

The observed value for the Box-Pierce chi square is 15.87 with 18 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/POV/Breakbulk

1.	2985.	2.985	8.0010
2.	6103.	6.103	8.7170
3.	6553.	6.553	8.7880
4.	13850.	13.850	9.5360
5.	6034.	6.034	8.7050
6.	6054.	6.054	8.7080
7.	8374.	8.374	9.0330
8.	139.	.139	4.9340
9.	6197.	6.197	8.7320
10.	4252.	4.252	8.3550
11.	2432.	2.432	7.7960
12.	6017.	6.017	8.7020
13.	3160.	3.160	8.0560
14.	5289.	5.289	8.5730
15.	298.	.298	5.6970
16.	16.	.016	2.7740
17.	4138.	4.138	8.3280
18.	3228.	3.228	8.0800
19.	4175.	4.175	8.3370
20.	4762.	4.762	8.4680
21.	13516.	13.516	9.5120
22.	4543.	4.543	8.4210
23.	12882.	12.882	9.4640
24.	6190.	6.190	8.7310
25.	6148.	6.148	8.7240
26.	9081.	9.081	9.1140
27.	7609.	7.609	8.9370
28.	3842.	3.842	8.2540
29.	8371.	8.371	9.0330
30.	10428.	10.428	9.2520
31.	10324.	10.324	9.2420
32.	5217.	5.217	8.5600
33.	12422.	12.422	9.4270
34.	5139.	5.139	8.5450
35.	594.	.594	6.3860
36.	251.	.251	5.5250
37.	3401.	3.401	8.1320
38.	11716.	11.716	9.3690
39.	4316.	4.316	8.3700
40.	3020.	3.020	8.0130
41.	4045.	4.045	8.3050
42.	5304.	5.304	8.5760
43.	2797.	2.797	7.9360
44.	6130.	6.130	8.7210
45.	11111.	11.111	9.3160
46.	8557.	8.557	9.0550
47.	4761.	4.761	8.4680
48.	582.	.582	6.3670
49.	153.	.153	5.0330
50.	7263.	7.263	8.8910
51.	4814.	4.814	8.4790
52.	6856.	6.856	8.8330
53.	6312.	6.312	8.7500
54.	7716.	7.716	8.9510
55.	9991.	9.991	9.2090
56.	9322.	9.322	9.1400
57.	10845.	10.845	9.2910
58.	12008.	12.008	9.3930
59.	420.	.420	6.0400
60.	3765.	3.765	8.2330
61.	8050.	8.050	8.9930
62.	3445.	3.445	8.1450
63.	10566.	10.567	9.2650
64.	11383.	11.383	9.3400
65.	2794.	2.794	7.9350
66.	3405.	3.405	8.1330
67.	7284.	7.284	8.8930
68.	11115.	11.115	9.3160
69.	7949.	7.949	8.9810
70.	1886.	1.886	7.5420
71.	486.	.486	6.1860
72.	2180.	2.180	7.6870
73.	2657.	2.657	7.8850
74.	10281.	10.281	9.2360
75.	12045.	12.045	9.3960
76.	3220.	3.220	8.0770
77.	505.	.505	6.2240
78.	860.	.860	6.7570
79.	20.	.020	2.9900
80.	4236.	4.236	8.3510
81.	9533.	9.533	9.1630
82.	12425.	12.425	9.4270
83.	54.	.054	3.9920
84.	2176.	2.176	7.6850

East Coast to Europe/POV/Breakbulk

TIME DIFFERENCES

12

1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANSLN	MA	1	1	-.2532	.1099	-2.30
2	TRANSLN	MA	2	12	.7787	.0454	17.14

FORECASTS

85 10	7.82430	1.68500	2.50064
85 11	6.84816	1.68500	6.96157
85 12	8.73609	1.68500	6.22351
86 1	8.39304	1.66500	4.41622
86 2	7.99022	1.66500	2.95195
86 3	6.20042	1.66500	3.64248
86 4	7.55328	1.68500	1.90699
86 5	7.92491	1.66500	2.76532
86 6	9.11217	1.66500	9.06494
86 7	6.68441	1.66500	5.91005
86 8	6.50233	1.68500	.66669
86 9	7.55795	1.72336	1.91591

SUM OF 12 FORECASTS = 97.33 SUM OF 12 ANTILOGS/1000 48.93

The observed value for the Box-Pierce chi square is 17.04 with 22 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/POV/Container

1.	2185.	2.185
2.	9185.	9.185
3.	3564.	3.564
4.	2303.	2.303
5.	1991.	1.991
6.	4069.	4.069
7.	7947.	7.947
8.	9705.	9.705
9.	7592.	7.592
10.	12272.	12.272
11.	17454.	17.455
12.	4856.	4.856
13.	11209.	11.209
14.	4406.	4.406
15.	10906.	10.906
16.	7116.	7.116
17.	5573.	5.573
18.	7719.	7.719
19.	6196.	6.196
20.	3932.	3.932
21.	5911.	5.911
22.	7482.	7.482
23.	7466.	7.466
24.	7819.	7.819
25.	4768.	4.768
26.	4070.	4.070
27.	4336.	4.336
28.	4332.	4.332
29.	2122.	2.122
30.	2595.	2.595
31.	1738.	1.738
32.	3682.	3.682
33.	8425.	8.425
34.	9695.	9.695
35.	14546.	14.546
36.	13669.	13.669
37.	3529.	3.529
38.	1888.	1.888
39.	5841.	5.841
40.	4207.	4.207
41.	4992.	4.992
42.	4552.	4.552
43.	5999.	5.999
44.	4334.	4.334
45.	5060.	5.060
46.	5270.	5.270
47.	13571.	13.571
48.	8692.	8.692
49.	10454.	10.454
50.	6297.	6.297
51.	5908.	5.908
52.	3679.	3.679
53.	2030.	2.030
54.	5140.	5.140
55.	5480.	5.480
56.	6437.	6.437
57.	6677.	6.677
58.	11917.	11.917
59.	18027.	18.027
60.	11854.	11.854
61.	11908.	11.908
62.	9218.	9.218
63.	5787.	5.787
64.	2660.	2.660
65.	8316.	8.316
66.	9801.	9.801
67.	2741.	2.741
68.	2670.	2.670
69.	6195.	6.195
70.	19406.	19.406
71.	15241.	15.241
72.	13839.	13.840
73.	7986.	7.986
74.	4288.	4.288
75.	4404.	4.404
76.	7363.	7.363
77.	9422.	9.422
78.	10545.	10.545
79.	11954.	11.954
80.	10376.	10.376
81.	6996.	6.996
82.	4910.	4.910
83.	15129.	15.129
84.	12193.	12.193

East Coast to Europe/POV/Container

TIME DIFFERENCES

$$1-84 \quad (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6928	.1131	6.12
2	TRANS	MA	2	12	.5338	.1463	3.65
3	TRANS	AR	1	1	.9729-001	.1582	.61
4	TRANS	AR	2	12	-.1236-001	.1571	-.08

FORECASTS

85	10	6.53809	4.26592
85	11	5.42391	4.46063
85	12	5.15371	4.67905
86	1	5.16536	4.86879
86	2	7.16685	5.05135
86	3	8.56071	5.22753
86	4	7.45600	5.39796
86	5	6.70825	5.56318
86	6	6.47616	5.72363
86	7	9.69152	5.87970
86	8	14.89116	6.03174
86	9	11.87191	6.60039

SUM OF 12 FORECASTS = 97.66

The observed value for the Box-Pierce chi square is 17.31 with 20 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/Ammunition/Breakbulk

1.	2713.	2.713
2.	3193.	3.193
3.	3134.	3.134
4.	3371.	3.371
5.	7726.	7.726
6.	0.	.000
7.	318.	.318
8.	2627.	2.627
9.	3299.	3.299
10.	1753.	1.753
11.	1559.	1.559
12.	909.	.909
13.	2476.	2.476
14.	1918.	1.918
15.	4402.	4.402
16.	1107.	1.107
17.	10052.	10.052
18.	6788.	6.788
19.	5942.	5.942
20.	10044.	10.044
21.	3285.	3.285
22.	2839.	2.839
23.	4220.	4.220
24.	14061.	14.061
25.	3146.	3.146
26.	5186.	5.186
27.	6113.	6.113
28.	4136.	4.136
29.	29.	.029
30.	3533.	3.533
31.	6287.	6.287
32.	12445.	12.445
33.	10847.	10.847
34.	8426.	8.426
35.	13888.	13.888
36.	4558.	4.558
37.	10536.	10.536
38.	403.	.403
39.	3947.	3.947
40.	0.	.000
41.	8286.	8.286
42.	2976.	2.976
43.	3519.	3.519
44.	10165.	10.165
45.	3515.	3.515
46.	4203.	4.203
47.	9912.	9.912
48.	15643.	15.643
49.	2.	.002
50.	6532.	6.532
51.	2355.	2.355
52.	3567.	3.567
53.	4018.	4.018
54.	8682.	8.682
55.	0.	.000
56.	3139.	3.139
57.	4288.	4.288
58.	5228.	5.228
59.	2826.	2.826
60.	4964.	4.964
61.	2367.	2.367
62.	3078.	3.078
63.	1.	.001
64.	2866.	2.866
65.	4426.	4.426
66.	0.	.000
67.	3240.	3.240
68.	4014.	4.014
69.	5878.	5.878
70.	4376.	4.376
71.	0.	.000
72.	2958.	2.958
73.	3279.	3.279
74.	2678.	2.678
75.	61.	.061
76.	2415.	2.415
77.	983.	.983
78.	2444.	2.444
79.	964.	.964
80.	1713.	1.713
81.	706.	.706
82.	1315.	1.315
83.	858.	.858
84.	624.	.624

East Coast to Europe/Ammunition/Breakbulk

TIME DIFFERENCES
1
1- 84 (1-6)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	3	.5091	.1153	4.41
2	TRANS	MA	1	5	.3575	.1023	3.50
3	TRANS	AR	1	1	-.7334	.1026	-7.15
4	TRANS	AR	1	2	-.5286	.1268	-4.17

FORECASTS

85	10	2.87897	3.46281
85	11	2.83919	3.58378
85	12	3.28762	3.61766
86	1	3.35210	3.70339
86	2	3.06783	3.72447
86	3	3.24235	3.73801
86	4	3.26400	3.76181
86	5	3.15604	3.76194
86	6	3.22390	3.76999
86	7	3.23151	3.78056
86	8	3.19006	3.78213
86	9	3.21644	3.78836

SUM OF 12 FORECASTS = 37.55

The observed value for the Box-Pierce chi square is 21.52 with 31 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/Ammunition/Container

1.	12.	.012	2.4850
2.	94.	.094	4.5430
3.	73.	.073	4.2900
4.	37.	.037	3.6110
5.	115.	.115	4.7480
6.	127.	.127	4.8470
7.	208.	.208	5.3380
8.	158.	.158	5.0630
9.	252.	.252	5.5300
10.	102.	.102	4.6250
11.	27.	.027	3.2910
12.	330.	.330	5.7990
13.	98.	.098	4.5850
14.	112.	.112	4.7190
15.	78.	.078	4.3570
16.	43.	.043	3.7640
17.	62.	.062	4.1200
18.	93.	.093	4.5370
19.	73.	.073	4.2860
20.	72.	.072	4.2730
21.	104.	.104	4.6400
22.	157.	.157	5.0540
23.	114.	.114	4.7370
24.	62.	.062	4.1280
25.	483.	.483	6.1790
26.	110.	.110	4.7000
27.	175.	.175	5.1650
28.	168.	.168	5.1210
29.	120.	.120	4.7840
30.	322.	.322	5.7750
31.	215.	.215	5.3700
32.	161.	.161	5.0790
33.	49.	.049	3.8940
34.	428.	.428	6.0590
35.	36.	.036	3.5900
36.	126.	.126	4.8330
37.	133.	.133	4.8930
38.	102.	.102	4.6300
39.	287.	.287	5.6600
40.	67.	.067	4.1990
41.	11.	.011	2.4090
42.	35.	.035	3.5640
43.	170.	.170	5.1360
44.	20.	.020	2.9840
45.	163.	.163	5.0960
46.	92.	.092	4.5230
47.	284.	.284	5.6500
48.	139.	.139	4.9350
49.	284.	.284	5.6460
50.	116.	.116	4.7510
51.	260.	.260	5.5610
52.	215.	.215	5.3710
53.	379.	.379	5.9370
54.	164.	.164	5.1010
55.	265.	.265	5.5810
56.	259.	.259	5.5570
57.	162.	.162	5.0870
58.	83.	.083	4.4220
59.	176.	.176	5.1600
60.	57.	.057	4.0440
61.	63.	.063	4.1360
62.	82.	.082	4.4050
63.	54.	.054	3.9850
64.	104.	.104	4.6460
65.	3.	.003	1.0120
66.	129.	.129	4.8590
67.	31.	.031	3.4320
68.	71.	.071	4.2890
69.	191.	.191	5.2500
70.	66.	.066	4.1940
71.	82.	.082	4.4120
72.	352.	.352	5.8630
73.	69.	.069	4.2290
74.	68.	.068	4.2230
75.	99.	.099	4.5920
76.	65.	.065	4.1800
77.	119.	.119	4.7810
78.	116.	.116	4.7580
79.	133.	.133	4.8900
80.	151.	.151	5.0160
81.	244.	.244	5.4960
82.	266.	.266	5.5820
83.	149.	.149	5.0020
84.	48.	.047	3.8620

East Coast to Europe/Ammunition/Container

TIME DIFFERENCES
1
1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANSLN	MA	1	1	.5717	.1150	4.97
2	TRANSLN	AR	1	1	-.3139	.1356	-2.32

85 10	5.19881	.84200	.18106
85 11	5.22707	.90372	.18625
85 12	5.21820	.93907	.18460
86 1	5.22098	.97940	.18512
86 2	5.22011	1.01619	.18495
86 3	5.22038	1.05228	.18500
86 4	5.22030	1.06699	.18499
86 5	5.22032	1.12068	.18499
86 6	5.22032	1.15338	.18499
86 7	5.22032	1.18517	.18499
86 8	5.22032	1.21614	.18499
86 9	5.22032	1.24633	.18499

SUM OF 12 FORECASTS = 62.63

The observed value for the Box-Pierce chi square is 23.69 with 83 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/Ammunition/MILVAN

1.	2913.	2.913
2.	0.	.000
3.	2865.	2.865
4.	2617.	2.617
5.	2094.	2.094
6.	3.	.003
7.	2718.	2.718
8.	2285.	2.285
9.	2656.	2.656
10.	1.	.001
11.	2927.	2.927
12.	2416.	2.416
13.	3143.	3.143
14.	3003.	3.003
15.	8.	.006
16.	2562.	2.562
17.	1023.	1.023
18.	2498.	2.488
19.	5114.	5.114
20.	3591.	3.591
21.	2275.	2.275
22.	2221.	2.221
23.	2594.	2.594
24.	2023.	2.023
25.	1489.	1.489
26.	3553.	3.553
27.	2119.	2.119
28.	2347.	2.347
29.	25.	.025
30.	2481.	2.481
31.	1879.	1.879
32.	1021.	1.021
33.	2032.	2.032
34.	2517.	2.517
35.	1631.	1.631
36.	1272.	1.272
37.	2002.	2.002
38.	4.	.004
39.	1503.	1.503
40.	0.	.000
41.	1751.	1.751
42.	2161.	2.161
43.	2094.	2.094
44.	1693.	1.693
45.	2360.	2.360
46.	1333.	1.333
47.	2614.	2.614
48.	1523.	1.523
49.	3.	.003
50.	2960.	2.960
51.	1632.	1.632
52.	1417.	1.417
53.	1630.	1.630
54.	3419.	3.419
55.	5540.	5.540
56.	3435.	3.435
57.	3787.	3.787
58.	2844.	2.844
59.	1963.	1.963
60.	2241.	2.241
61.	2338.	2.338
62.	2227.	2.227
63.	1.	.001
64.	1691.	1.691
65.	6097.	6.097
66.	0.	.000
67.	3260.	3.260
68.	3363.	3.363
69.	3197.	3.197
70.	2224.	2.224
71.	2.	.002
72.	2759.	2.759
73.	3006.	3.006
74.	3144.	3.144
75.	16.	.016
76.	5926.	5.926
77.	6593.	6.593
78.	6011.	6.011
79.	6205.	6.205
80.	6313.	6.313
81.	5703.	5.703
82.	6375.	6.375
83.	4910.	4.910
84.	5196.	5.196

East Coast to Europe/Ammunition/MILVAN

TIME DIFFERENCES

1

1- 84 (1-6)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7126	.0795	8.96
2	TRANS	MA	1	6	.1461	.0986	1.48
3	TRANS	MA	2	12	-.1374	.1170	-1.17

FORECASTS

85 10	4.59947	1.53761
85 11	4.43908	1.59520
85 12	4.04264	1.65078
86 1	4.61764	1.70454
86 2	4.59570	1.75666
86 3	4.63536	1.76904
86 4	4.60593	1.78133
86 5	4.61348	1.79353
86 6	4.53359	1.80566
86 7	4.64216	1.81770
86 8	4.48013	1.82966
86 9	4.41376	1.87546

SUM OF 12 FORECASTS = 54.22

The observed value for the Box-Pierce chi square is 15.91 with 32 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/General/Breakbulk

1.	2106.	2.106
2.	2468.	2.468
3.	2254.	2.254
4.	2663.	2.663
5.	3668.	3.668
6.	2604.	2.604
7.	3474.	3.474
8.	2826.	2.826
9.	4107.	4.107
10.	870.	.870
11.	4210.	4.210
12.	1966.	1.966
13.	3944.	3.944
14.	761.	.761
15.	1965.	1.965
16.	79.	.079
17.	1659.	1.659
18.	3739.	3.739
19.	3036.	3.036
20.	2793.	2.793
21.	3507.	3.507
22.	2586.	2.586
23.	1036.	1.036
24.	3197.	3.197
25.	2172.	2.172
26.	3273.	3.273
27.	3366.	3.366
28.	1926.	1.926
29.	2216.	2.216
30.	2402.	2.402
31.	1240.	1.240
32.	2511.	2.511
33.	2303.	2.303
34.	2027.	2.027
35.	818.	.818
36.	1493.	1.493
37.	3316.	3.316
38.	1210.	1.210
39.	1029.	1.029
40.	2146.	2.146
41.	3053.	3.053
42.	888.	.888
43.	2882.	2.882
44.	1656.	1.656
45.	1414.	1.414
46.	1604.	1.604
47.	549.	.549
48.	3617.	3.617
49.	2008.	2.008
50.	2821.	2.821
51.	266.	.266
52.	397.	.397
53.	601.	.601
54.	2535.	2.535
55.	438.	.438
56.	1261.	1.261
57.	1642.	1.642
58.	2557.	2.557
59.	2136.	2.136
60.	3823.	3.823
61.	3762.	3.762
62.	3789.	3.789
63.	3168.	3.168
64.	3280.	3.280
65.	2768.	2.768
66.	2481.	2.481
67.	1204.	1.204
68.	1931.	1.931
69.	2895.	2.895
70.	2073.	2.073
71.	874.	.874
72.	2785.	2.785
73.	973.	.973
74.	1392.	1.392
75.	3039.	3.039
76.	1719.	1.719
77.	386.	.386
78.	3722.	3.722
79.	1267.	1.267
80.	2889.	2.889
81.	1596.	1.596
82.	2896.	2.896
83.	308.	.308
84.	2398.	2.398

East Coast to Europe/General/Breakbulk

TIME DIFFERENCES

1

1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9623	.0324	29.69
2	TRANS	MA	2	5	.2591	.1162	2.23
3	TRANS	AR	1	2	.2666	.1170	2.28

FORECASTS

85 10	1.42766	1.04211
85 11	2.28224	1.08921
85 12	1.87685	1.09034
86 1	2.46093	1.09734
86 2	2.02897	1.11866
86 3	2.18466	1.12038
86 4	2.06952	1.12075
86 5	2.11102	1.12169
86 6	2.09033	1.12188
86 7	2.09139	1.12264
86 8	2.08321	1.12317
86 9	2.08616	1.12389

SUM OF 12 FORECASTS = 24.78

The observed value for the Box-Pierce chi square is 18.82 with 32 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/General/Container

1.	37809.	37.609
2.	73510.	73.510
3.	69400.	69.400
4.	48498.	48.498
5.	55914.	55.914
6.	69358.	69.358
7.	64379.	84.379
8.	95440.	95.440
9.	77352.	77.352
10.	93695.	93.695
11.	65648.	85.648
12.	74701.	74.701
13.	67325.	67.325
14.	73538.	73.538
15.	64262.	64.262
16.	66269.	66.269
17.	61699.	61.699
18.	91637.	91.637
19.	76099.	76.099
20.	77530.	77.530
21.	86640.	86.640
22.	86425.	86.425
23.	91607.	91.607
24.	62266.	62.266
25.	64027.	64.027
26.	79627.	79.627
27.	74593.	74.593
28.	58657.	58.657
29.	62944.	62.944
30.	66106.	66.106
31.	71346.	71.346
32.	86534.	86.534
33.	76594.	76.594
34.	71131.	71.131
35.	76470.	76.470
36.	69299.	69.299
37.	77769.	77.769
38.	56129.	56.129
39.	67724.	67.724
40.	53093.	53.093
41.	64064.	64.064
42.	78674.	78.674
43.	70525.	70.525
44.	61859.	81.659
45.	67286.	67.286
46.	65818.	65.818
47.	73549.	73.549
48.	68477.	68.477
49.	70711.	70.711
50.	64759.	64.760
51.	68605.	68.605
52.	71811.	71.811
53.	64915.	64.915
54.	82282.	82.282
55.	94601.	94.601
56.	92448.	92.448
57.	68702.	88.702
58.	68558.	88.558
59.	82347.	82.347
60.	68937.	68.937
61.	76386.	76.386
62.	75482.	75.482
63.	65871.	65.871
64.	76480.	76.480
65.	71805.	71.805
66.	92500.	92.500
67.	86263.	86.263
68.	79338.	79.338
69.	72621.	72.821
70.	65275.	65.275
71.	68262.	68.262
72.	72949.	72.949
73.	81982.	81.983
74.	73439.	73.439
75.	75450.	75.450
76.	73401.	73.401
77.	76511.	76.511
78.	90741.	90.741
79.	88776.	88.776
80.	96422.	96.422
81.	93674.	93.674
82.	90932.	90.932
83.	100338.	100.338
84.	87389.	87.390

East Coast to Europe/General/Container

TIME DIFFERENCES

$1-\ 84\quad (1-B^{1})\,(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6480	.1217	5.32
2	TRANS	MA	1	6	.1002	.0857	1.17
3	TRANS	MA	2	12	.7679	.0470	16.33
4	TRANS	AR	1	1	.3056-001	.1516	.20

FORECASTS		
85 10	87.83616	10.91863
85 11	85.28288	11.52933
85 12	82.92470	12.10928
86 1	77.64312	12.66264
86 2	78.18996	13.19281
86 3	93.92582	13.46252
86 4	95.72638	13.72087
86 5	100.74557	13.97427
86 6	92.95553	14.22315
86 7	93.69655	14.46774
86 8	95.47677	14.70827
86 9	85.75999	15.53995

SUM OF 12 FORECASTS = 1070.16

The observed value for the Box-Pierce chi square is 19.86 with 19 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/General/MILVAN

1.	109.	.109
2.	31.	.031
3.	96.	.096
4.	246.	.246
5.	119.	.119
6.	351.	.351
7.	121.	.121
8.	469.	.469
9.	410.	.410
10.	307.	.307
11.	385.	.385
12.	107.	.107
13.	70.	.070
14.	76.	.076
15.	37.	.037
16.	0.	.000
17.	162.	.162
18.	143.	.143
19.	18.	.016
20.	25.	.025
21.	572.	.572
22.	0.	.000
23.	40.	.041
24.	49.	.049
25.	118.	.116
26.	15.	.015
27.	755.	.755
28.	28.	.026
29.	390.	.390
30.	15.	.015
31.	460.	.460
32.	646.	.646
33.	127.	.127
34.	105.	.105
35.	11.	.011
36.	63.	.063
37.	80.	.080
38.	51.	.051
39.	88.	.088
40.	0.	.000
41.	65.	.065
42.	241.	.241
43.	146.	.146
44.	30.	.030
45.	102.	.102
46.	68.	.068
47.	14.	.014
48.	152.	.152
49.	115.	.115
50.	72.	.072
51.	45.	.045
52.	198.	.198
53.	60.	.060
54.	144.	.144
55.	402.	.402
56.	88.	.088
57.	318.	.318
58.	122.	.122
59.	9.	.009
60.	101.	.101
61.	86.	.086
62.	13.	.014
63.	110.	.110
64.	454.	.454
65.	563.	.563
66.	27.	.027
67.	22.	.022
68.	68.	.068
69.	22.	.022
70.	164.	.164
71.	22.	.022
72.	29.	.029
73.	0.	.000
74.	132.	.132
75.	219.	.219
76.	146.	.146
77.	0.	.000
78.	72.	.072
79.	162.	.162
80.	86.	.086
81.	740.	.740
82.	731.	.731
83.	694.	.694
84.	277.	.277

East Coast to Europe/General/MILVAN

TIME DIFFERENCES

$$1-84 \quad (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7598	.0818	9.28
2	TRANS	MA	2	12	.8219	.0451	18.20

FORECASTS		
85 10	.32067	.24338
85 11	.29358	.24993
85 12	.40110	.25632
86 1	.43290	.26254
86 2	.41362	.26863
86 3	.41533	.27458
86 4	.40913	.28040
86 5	.47584	.28610
86 6	.59655	.29170
86 7	.51710	.29718
86 8	.48993	.30257
86 9	.37155	.31835

SUM OF 12 FORECASTS = 5.14

The observed value for the Box-Pierce chi square is 21.37 with 21 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/HHG/Container

1.	3700.	3.700
2.	8002.	8.002
3.	4712.	4.712
4.	1699.	1.699
5.	724.	.724
6.	240.	.240
7.	491.	.491
8.	344.	.344
9.	212.	.212
10.	448.	.448
11.	609.	.609
12.	525.	.525
13.	520.	.520
14.	525.	.525
15.	254.	.254
16.	361.	.361
17.	347.	.347
18.	304.	.304
19.	356.	.356
20.	343.	.343
21.	333.	.333
22.	1273.	1.273
23.	1247.	1.247
24.	665.	.665
25.	983.	.983
26.	657.	.657
27.	586.	.586
28.	439.	.439
29.	220.	.220
30.	334.	.334
31.	328.	.328
32.	480.	.480
33.	439.	.439
34.	583.	.583
35.	684.	.684
36.	313.	.313
37.	484.	.484
38.	233.	.233
39.	383.	.383
40.	447.	.447
41.	404.	.404
42.	323.	.323
43.	316.	.316
44.	337.	.337
45.	320.	.320
46.	320.	.320
47.	394.	.394
48.	495.	.495
49.	386.	.386
50.	262.	.262
51.	296.	.296
52.	313.	.313
53.	294.	.294
54.	255.	.255
55.	377.	.377
56.	321.	.321
57.	269.	.269
58.	461.	.461
59.	476.	.476
60.	341.	.341
61.	756.	.756
62.	269.	.269
63.	436.	.436
64.	695.	.695
65.	714.	.714
66.	573.	.573
67.	486.	.486
68.	317.	.317
69.	372.	.372
70.	506.	.506
71.	567.	.567
72.	471.	.471
73.	575.	.575
74.	566.	.566
75.	532.	.532
76.	896.	.896
77.	713.	.713
78.	503.	.503
79.	318.	.318
80.	498.	.498
81.	536.	.536
82.	696.	.696
83.	885.	.885
84.	878.	.878

East Coast to Europe/HHG/Container

TIME DIFFERENCES

$$(1-B)(1-B^{12})$$

1- 84

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	AR	1	1	.8057	.0184	43.80
2	TRANS	AR	2	12	-.9106-001	.0249	-3.66

FORECASTS

85 10	.80380	.27933
85 11	.71007	.31299
85 12	.66046	.33303
86 1	.98860	.34541
86 2	.80249	.35322
86 3	.58106	.35820
86 4	.39122	.36139
86 5	.52847	.36345
86 6	.55858	.36478
86 7	.71067	.36564
86 8	.88057	.36620
86 9	.71884	.42414

SUM OF 12 FORECASTS = 8.33

The observed value for the Box-Pierce chi square is 5.70 with 21 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/CONEX/Breakbulk

1.	247.	.247
2.	85.	.085
3.	0.	.000
4.	0.	.000
5.	0.	.000
6.	0.	.000
7.	85.	.085
8.	0.	.000
9.	0.	.000
10.	608.	.608
11.	0.	.000
12.	11.	.012
13.	58.	.058
14.	19.	.019
15.	0.	.000
16.	0.	.000
17.	70.	.070
18.	0.	.000
19.	81.	.081
20.	0.	.000
21.	64.	.064
22.	314.	.314
23.	271.	.271
24.	874.	.874
25.	1309.	1.309
26.	533.	.533
27.	2800.	2.800
28.	0.	.000
29.	0.	.000
30.	103.	.103
31.	0.	.000
32.	0.	.000
33.	101.	.101
34.	1426.	1.426
35.	0.	.000
36.	1432.	1.432
37.	631.	.631
38.	0.	.000
39.	87.	.087
40.	44.	.044
41.	27.	.027
42.	1286.	1.286
43.	8.	.008
44.	0.	.000
45.	0.	.000
46.	324.	.324
47.	0.	.000
48.	874.	.874
49.	64.	.064
50.	753.	.753
51.	0.	.000
52.	0.	.000
53.	192.	.192
54.	0.	.000
55.	192.	.192
56.	96.	.096
57.	486.	.486
58.	324.	.324
59.	0.	.000
60.	874.	.874

East Coast to Europe/CONEX/Breakbulk

TIME DIFFERENCES

1 12

1- 6ₒ (1-B) (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9546	.0387	24.64
2	TRANS	MA	2	12	.8644	.0661	13.08

FORECASTS

85 10	.20073	.64423
85 11	.09788	.64489
85 12	.13654	.64555
86 1	-.15229	.64622
86 2	-.12203	.64688
86 3	.00375	.64754
86 4	-.07570	.64820
86 5	-.14438	.64885
86 6	-.07561	.64951
86 7	.43589	.65017
86 8	-.13367	.65083
86 9	.21797	.66117

SUM OF 12 FORECASTS = .34

The observed value for the Box-Pierce chi square is 16.21 with 21 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins 10-77.

East Coast to Europe/CONEX/Container

1.	23.	.023
2.	402.	.402
3.	253.	.253
4.	57.	.058
5.	271.	.271
6.	626.	.626
7.	376.	.376
8.	835.	.835
9.	202.	.202
10.	237.	.237
11.	217.	.217
12.	225.	.225
13.	225.	.225
14.	124.	.124
15.	92.	.092
16.	184.	.184
17.	293.	.293
18.	367.	.367
19.	382.	.382
20.	916.	.916
21.	204.	.204
22.	226.	.226
23.	134.	.134
24.	137.	.137
25.	302.	.302
26.	270.	.270
27.	113.	.113
28.	110.	.110
29.	32.	.032
30.	226.	.226
31.	457.	.457
32.	135.	.135
33.	60.	.060
34.	87.	.087
35.	205.	.205
36.	224.	.224
37.	505.	.505
38.	299.	.299
39.	107.	.107
40.	399.	.399
41.	187.	.187
42.	315.	.315
43.	289.	.289
44.	162.	.162
45.	515.	.515
46.	759.	.759
47.	161.	.161
48.	578.	.578
49.	534.	.534
50.	333.	.333
51.	330.	.330
52.	316.	.316
53.	363.	.363
54.	365.	.365
55.	746.	.746
56.	377.	.377
57.	514.	.514
58.	513.	.513
59.	372.	.372
60.	447.	.447
61.	339.	.339
62.	640.	.640
63.	245.	.245
64.	366.	.366
65.	292.	.292
66.	685.	.685
67.	308.	.308
68.	639.	.639
69.	336.	.336
70.	257.	.257
71.	410.	.410
72.	514.	.514
73.	500.	.500
74.	413.	.413
75.	261.	.261
76.	546.	.546
77.	738.	.738
78.	609.	.609
79.	544.	.544
80.	328.	.328
81.	488.	.488
82.	573.	.573
83.	306.	.306
84.	793.	.793

East Coast to Europe/CONEX/Container

TIME DIFFERENCES

$$1-\ 84\ (1-B^{1})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9034	.0485	18.62
2	TRANS	MA	2	12	-.2881	.1103	-2.61

FORECASTS

85 10	.49336	.19689
85 11	.44007	.19771
85 12	.42994	.19861
86 1	.49963	.19951
86 2	.56349	.20040
86 3	.49342	.20129
86 4	.51561	.20218
86 5	.41711	.20306
86 6	.48930	.20394
86 7	.51873	.20482
86 8	.43019	.20569
86 9	.47375	.21905

SUM OF 12 FORECASTS = 5.76

The observed value for the Box-Pierce chi square is 24.02 with 33 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/Special/Breakbulk

1.	13084.	13.084
2.	9660.	9.660
3.	13071.	13.071
4.	9468.	9.468
5.	8942.	8.942
6.	10877.	10.877
7.	14334.	14.334
8.	13940.	13.940
9.	21679.	21.679
10.	11407.	11.407
11.	13657.	13.657
12.	9888.	9.888
13.	18889.	18.889
14.	12193.	12.193
15.	19534.	19.534
16.	1200.	1.200
17.	13175.	13.175
18.	16052.	18.052
19.	9444.	9.444
20.	15208.	15.208
21.	17360.	17.360
22.	13176.	13.176
23.	10634.	10.634
24.	29405.	29.405
25.	13945.	13.945
26.	36226.	36.226
27.	21165.	21.165
28.	30897.	30.897
29.	11807.	11.807
30.	11561.	11.561
31.	11528.	11.529
32.	16937.	16.938
33.	17336.	17.336
34.	19897.	19.897
35.	4487.	4.487
36.	11255.	11.255
37.	26407.	26.408
38.	26296.	26.296
39.	23696.	23.696
40.	10206.	10.206
41.	12075.	12.075
42.	13176.	13.176
43.	13956.	13.956
44.	20249.	20.249
45.	15390.	15.391
46.	9011.	9.011
47.	6625.	6.825
48.	11731.	11.731
49.	12820.	12.820
50.	14052.	14.052
51.	8186.	8.186
52.	5747.	5.747
53.	4155.	4.155
54.	10726.	10.726
55.	3591.	3.591
56.	12099.	12.099
57.	12186.	12.188
58.	15997.	15.997
59.	9172.	9.172
60.	11152.	11.152
61.	13782.	13.783
62.	6745.	6.745
63.	11538.	11.538
64.	13403.	13.403
65.	7691.	7.691
66.	11159.	11.159
67.	11593.	11.593
68.	15479.	15.479
69.	12629.	12.629
70.	20194.	20.194
71.	16667.	16.667
72.	44232.	44.232
73.	4174.	4.174
74.	17479.	17.479
75.	22788.	22.788
76.	7150.	7.150
77.	5602.	5.602
78.	34126.	34.126
79.	40529.	40.529
80.	43490.	43.490
81.	14066.	14.066
82.	12488.	12.488
83.	17984.	17.984
84.	29746.	29.746

East Coast to Europe/Special/Breakbulk

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                    TIME      DIFFERENCES
                                   1        12
                    1-   84   (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7684	.0806	9.54
2	TRANS	MA	2	12	.7749	.0474	16.34
3	TRANS	AR	1	3	-.2305	.1248	-1.85

FORECASTS

85	10	25.76371	9.96818
85	11	25.55637	10.23923
85	12	26.21751	10.23923
86	1	16.94005	10.36502
86	2	15.30545	10.52880
86	3	24.10583	10.76674
86	4	25.68155	10.92516
86	5	29.40382	11.06131
86	6	23.61407	11.21625
86	7	21.97646	11.36394
86	8	20.55728	11.50973
86	9	30.06114	12.19956

SUM OF 12 FORECASTS = 285.16

The observed value for the Box-Pierce chi square is 13.55 with 20 degrees of freedom, which is not significant at the .05 level.

East Coast to Europe/Special/Container

1.	49.	.049
2.	21.	.021
3.	100.	.100
4.	115.	.115
5.	208.	.208
6.	124.	.124
7.	59.	.059
8.	324.	.324
9.	71.	.071
10.	303.	.303
11.	533.	.533
12.	87.	.087
13.	74.	.074
14.	26.	.026
15.	56.	.056
16.	109.	.109
17.	53.	.053
18.	218.	.218
19.	173.	.173
20.	155.	.155
21.	174.	.174
22.	129.	.129
23.	270.	.270
24.	90.	.090
25.	246.	.246
26.	322.	.322
27.	212.	.212
28.	352.	.352
29.	444.	.444
30.	206.	.206
31.	92.	.092
32.	490.	.490
33.	182.	.182
34.	164.	.164
35.	451.	.451
36.	760.	.760
37.	194.	.194
38.	208.	.208
39.	639.	.639
40.	280.	.280
41.	272.	.272
42.	269.	.269
43.	134.	.134
44.	863.	.863
45.	216.	.216
46.	249.	.249
47.	103.	.103
48.	279.	.279
49.	123.	.123
50.	385.	.385
51.	199.	.199
52.	180.	.180
53.	128.	.128
54.	282.	.282
55.	215.	.215
56.	218.	.218
57.	187.	.187
58.	109.	.109
59.	377.	.377
60.	96.	.096
61.	400.	.400
62.	84.	.084
63.	68.	.068
64.	186.	.186
65.	118.	.118
66.	164.	.164
67.	183.	.183
68.	136.	.136
69.	165.	.165
70.	179.	.179
71.	118.	.118
72.	351.	.351
73.	208.	.208
74.	178.	.178
75.	195.	.195
76.	266.	.266
77.	251.	.251
78.	424.	.424
79.	237.	.237
80.	278.	.278
81.	431.	.431
82.	327.	.327
83.	674.	.674
84.	270.	.270

East Coast to Europe/Special/Container

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TIME      DIFFERENCES
                    1       12
1-   84   (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8283	.0671	12.34
2	TRANS	MA	2	12	.8436	.0503	16.76

FORECASTS

85 10	.29634	.18766
85 11	.27316	.19033
85 12	.31522	.19296
86 1	.32603	.19556
86 2	.34542	.19812
86 3	.35704	.20065
86 4	.27483	.20314
86 5	.46956	.20561
86 6	.31882	.20805
86 7	.37798	.21046
86 8	.55533	.21264
86 9	.37134	.22132

SUM OF 12 FORECASTS = 4.26

The observed value for the Box-Pierce chi square is 21.17 with 21 degrees of freedom, which is not significant at the .05 level.

Europe to East Coast/POV/Breakbulk

1.	8136.	8.136	9.0040
2.	12349.	12.349	9.4210
3.	4814.	4.814	8.4790
4.	5708.	5.708	8.6500
5.	5885.	5.885	8.6800
6.	5836.	5.836	8.6720
7.	6592.	6.592	8.7940
8.	14649.	14.649	9.5920
9.	11992.	11.992	9.3920
10.	12015.	12.015	9.3940
11.	10994.	10.995	9.3050
12.	7265.	7.265	8.8910
13.	7016.	7.016	8.8560
14.	10160.	10.160	9.2260
15.	6819.	6.819	8.8270
16.	7892.	7.892	8.9740
17.	4693.	4.693	8.4540
18.	6878.	6.878	8.8360
19.	13513.	13.513	9.5110
20.	12056.	12.056	9.3970
21.	14272.	14.272	9.5660
22.	11539.	11.539	9.3530
23.	8045.	8.045	8.9930
24.	6418.	6.418	8.7670
25.	9479.	9.479	9.1570
26.	8915.	8.915	9.0950
27.	7326.	7.326	8.8990
28.	7247.	7.247	8.8880
29.	6668.	6.668	8.8050
30.	9115.	9.115	9.1180
31.	10267.	10.267	9.2370
32.	16815.	16.815	9.7360
33.	21540.	21.540	9.9780
34.	12403.	12.403	9.4260
35.	11489.	11.489	9.3490
36.	8864.	8.864	9.0900
37.	8459.	8.459	9.0430
38.	7178.	7.178	8.8790
39.	6476.	6.476	8.7760
40.	5484.	5.484	8.6100
41.	3394.	3.394	8.1300
42.	11443.	11.443	9.3450
43.	11957.	11.957	9.3890
44.	8424.	8.424	9.0390
45.	16812.	16.812	9.7300
46.	12402.	12.402	9.4260
47.	8443.	8.443	9.0410
48.	5734.	5.734	8.6540
49.	2321.	2.321	7.7500
50.	9990.	9.990	9.2090
51.	7816.	7.816	8.9640
52.	6279.	6.279	8.7450
53.	6888.	6.888	8.8380
54.	10128.	10.128	9.2230
55.	7237.	7.237	8.8870
56.	11001.	11.001	9.3060
57.	14404.	14.404	9.5750
58.	7646.	7.646	8.9420
59.	6184.	6.184	8.7300
60.	7304.	7.304	8.8960
61.	4565.	4.565	8.4260
62.	10676.	10.676	9.2760
63.	4389.	4.389	8.3870
64.	6433.	6.433	8.7690
65.	5723.	5.723	8.6520
66.	5292.	5.292	8.5740
67.	10822.	10.822	9.2890
68.	9823.	9.823	9.1920
69.	13955.	13.955	9.5440
70.	5633.	5.633	8.6360
71.	7483.	7.483	8.9200
72.	4808.	4.808	8.4760
73.	3618.	3.618	8.1940
74.	6901.	6.901	8.8390
75.	5689.	5.689	8.6460
76.	5403.	5.403	8.5950
77.	3610.	3.610	8.1920
78.	5150.	5.150	8.5470
79.	9698.	9.698	9.1800
80.	6849.	6.849	8.8320
81.	18362.	18.362	9.8160
82.	12873.	12.873	9.4630
83.	7716.	7.716	8.9510
84.	7995.	7.995	8.9870

Europe to East Coast/POV/Breakbulk

TIME DIFFERENCES

$1- \quad 84 \quad (1-B^{1}) \ (1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANSLN	MA	1	12	.8497	.0435	19.55
2	TRANSLN	AR	1	1	-.7273	.0986	-7.37
3	TRANSLN	AR	1	2	-.5119	.0962	-5.32

FORECASTS

85 10	8.74584	.35368	6.28449
85 11	9.10622	.36723	9.01117
85 12	8.85382	.42895	7.00108
86 1	8.77874	.44804	6.49469
86 2	6.58326	.46754	5.34160
86 3	8.94495	.50021	7.66906
86 4	9.14237	.52038	9.34288
86 5	9.40349	.54043	12.13064
86 6	9.68776	.56410	16.11910
86 7	9.34351	.58343	11.42444
86 8	9.17464	.60243	9.64929
86 9	8.92574	.63703	7.52315

SUM OF 12 FORECASTS = 108.69

The observed value for the Box-Pierce chi square is 23.24 with 20 degrees of freedom, which is not significant at the .05 level.

Europe to East Coast/POV/Container

1.	39.	.039
2.	226.	.226
3.	2836.	2.836
4.	1495.	1.495
5.	439.	.439
6.	297.	.297
7.	588.	.588
8.	610.	.610
9.	3015.	3.015
10.	3047.	3.047
11.	641.	.641
12.	480.	.480
13.	1307.	1.307
14.	244.	.244
15.	298.	.298
16.	135.	.135
17.	368.	.368
18.	401.	.401
19.	363.	.363
20.	859.	.859
21.	895.	.895
22.	1102.	1.102
23.	783.	.783
24.	565.	.565
25.	643.	.643
26.	706.	.706
27.	793.	.793
28.	746.	.746
29.	603.	.603
30.	641.	.641
31.	842.	.842
32.	3920.	3.920
33.	1457.	1.457
34.	1480.	1.480
35.	432.	.432
36.	854.	.854
37.	1131.	1.131
38.	703.	.703
39.	350.	.350
40.	1881.	1.881
41.	708.	.708
42.	817.	.817
43.	996.	.996
44.	1435.	1.435
45.	2331.	2.331
46.	1969.	1.969
47.	2211.	2.211
48.	4861.	4.861
49.	3709.	3.709
50.	2528.	2.528
51.	595.	.595
52.	576.	.576
53.	640.	.640
54.	983.	.983
55.	842.	.842
56.	1081.	1.081
57.	3301.	3.301
58.	3386.	3.386
59.	3587.	3.587
60.	1827.	1.827
61.	2588.	2.588
62.	1561.	1.561
63.	1727.	1.727
64.	944.	.944
65.	1467.	1.467
66.	2343.	2.343
67.	2586.	2.586
68.	5188.	5.188
69.	4075.	4.075
70.	6194.	6.194
71.	4107.	4.107
72.	3021.	3.021
73.	4671.	4.671
74.	1959.	1.959
75.	1639.	1.639
76.	1783.	1.783
77.	4173.	4.173
78.	1722.	1.722
79.	1746.	1.746
80.	3232.	3.232
81.	2469.	2.469
82.	1376.	1.376
83.	1187.	1.187
84.	3611.	3.611

Europe to East Coast/POV/Container

TIME DIFFERENCES

$$1- 84 \quad (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9091	.0586	15.51
2	TRANS	MA	2	12	.7775	.0739	10.52
3	TRANS	AR	1	1	.3348	.1260	2.66
4	TRANS	AR	2	12	-.1772	.1320	-1.34

FORECASTS

85 10	3.00836	1.29297
85 11	2.51425	1.32243
85 12	2.46005	1.33763
86 1	2.41742	1.34908
86 2	2.51394	1.35935
86 3	2.67106	1.36927
86 4	2.74838	1.37886
86 5	3.92138	1.38842
86 6	4.01837	1.39791
86 7	4.45238	1.40732
86 8	3.74377	1.41667
86 9	3.58717	1.43310

SUM OF 12 FORECASTS = 38.06

The observed value for the Box-Pierce chi square is 19.99 with 19 degrees of freedom, which is not significant at the .05 level.

Europe to East Coast/General/Breakbulk

1.	1582.	1.582
2.	899.	.899
3.	839.	.839
4.	625.	.625
5.	653.	.653
6.	214.	.214
7.	503.	.503
8.	578.	.578
9.	221.	.221
10.	823.	.823
11.	187.	.187
12.	92.	.092
13.	253.	.253
14.	61.	.061
15.	153.	.153
16.	80.	.080
17.	200.	.200
18.	681.	.681
19.	536.	.536
20.	508.	.508
21.	559.	.559
22.	441.	.441
23.	153.	.153
24.	619.	.619
25.	298.	.298
26.	356.	.356
27.	195.	.195
28.	106.	.106
29.	441.	.441
30.	268.	.268
31.	263.	.263
32.	115.	.115
33.	88.	.088
34.	47.	.047
35.	484.	.484
36.	313.	.313
37.	565.	.565
38.	1411.	1.411
39.	22.	.022
40.	325.	.325
41.	44.	.044
42.	235.	.235
43.	323.	.323
44.	46.	.046
45.	168.	.168
46.	477.	.477
47.	60.	.060
48.	31.	.031
49.	225.	.225
50.	146.	.146
51.	534.	.534
52.	94.	.094
53.	84.	.084
54.	44.	.044
55.	47.	.047
56.	432.	.432
57.	728.	.728
58.	1.	.001
59.	396.	.396
60.	762.	.762
61.	530.	.530
62.	474.	.474
63.	284.	.284
64.	200.	.200
65.	102.	.102
66.	529.	.529
67.	618.	.618
68.	292.	.292
69.	72.	.072
70.	227.	.227
71.	118.	.118
72.	128.	.128
73.	451.	.451
74.	79.	.079
75.	46.	.046
76.	535.	.535
77.	63.	.063
78.	298.	.298
79.	24.	.025
80.	670.	.670
81.	279.	.279
82.	505.	.505
83.	351.	.351
84.	574.	.574

Europe to East Coast/General/Breakbulk

TIME DIFFERENCES

1

1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7541	.0599	12.60
2	TRANS	MA	2	12	.3045	.0943	3.23

FORECASTS

85 10	.26250	.32282
85 11	.37625	.33189
85 12	.40509	.34072
86 1	.27406	.34933
86 2	.42887	.35773
86 3	.31716	.36594
86 4	.39151	.37397
86 5	.21705	.38183
86 6	.34725	.38953
86 7	.28209	.39708
86 8	.33071	.40449
86 9	.32116	.40491

SUM OF 12 FORECASTS = 3.95

The observed value for the Box-Pierce chi square is 21.84 with 33 degrees of freedom, which is not significant at the .05 level.

Europe to East Coast/General/MILVAN

1.	1207.	1.207
2.	2296.	2.296
3.	2724.	2.724
4.	456.	.456
5.	2251.	2.251
6.	1036.	1.036
7.	1318.	1.318
8.	1117.	1.117
9.	202.	.202
10.	2443.	2.443
11.	1931.	1.931
12.	466.	.466
13.	978.	.978
14.	34.	.034
15.	1167.	1.167
16.	114.	.114
17.	0.	.000
18.	141.	.141
19.	625.	.625
20.	465.	.465
21.	553.	.553
22.	1358.	1.358
23.	392.	.392
24.	869.	.869
25.	536.	.536
26.	567.	.567
27.	516.	.516
28.	409.	.409
29.	1141.	1.141
30.	1015.	1.015
31.	170.	.170
32.	522.	.522
33.	876.	.876
34.	890.	.890
35.	706.	.706
36.	0.	.000
37.	621.	.621
38.	921.	.921
39.	45.	.045
40.	73.	.073
41.	526.	.526
42.	287.	.287
43.	2467.	2.467
44.	94.	.094
45.	97.	.097
46.	452.	.452
47.	860.	.860
48.	65.	.065
49.	308.	.308
50.	284.	.284
51.	96.	.096
52.	394.	.394
53.	139.	.139
54.	145.	.145
55.	88.	.088
56.	375.	.375
57.	605.	.605
58.	0.	.000
59.	40.	.040
60.	654.	.654
61.	599.	.599
62.	2293.	2.293
63.	1419.	1.419
64.	138.	.138
65.	1027.	1.027
66.	276.	.276
67.	341.	.341
68.	227.	.227
69.	1440.	1.440
70.	199.	.199
71.	1491.	1.491
72.	451.	.451
73.	28.	.028
74.	2510.	2.510
75.	1056.	1.056
76.	256.	.256
77.	776.	.776
78.	457.	.457
79.	597.	.597
80.	1064.	1.064
81.	1505.	1.505
82.	2461.	2.461
83.	3553.	3.553
84.	2743.	2.743

Europe to East Coast/General/MILVAN

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TIME      DIFFERENCES
                1       12
1-   84   (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6386	.1434	4.45
2	TRANS	MA	2	12	.7992	.0446	17.94
3	TRANS	AR	1	1	-.5360-001	.1714	-.31

FORECASTS

85 10	1.86352	.99828
85 11	2.35281	1.05111
85 12	2.01701	1.10085
86 1	1.02135	1.14946
86 2	1.80264	1.19418
86 3	1.27658	1.23921
86 4	1.56724	1.28072
86 5	1.40242	1.32187
86 6	1.51153	1.36178
86 7	2.10396	1.40055
86 8	2.36282	1.43828
86 9	1.40481	1.52899

SUM OF 12 FORECASTS = 20.68

The observed value for the Box-Pierce chi square is 30.23 with 20 degrees of freedom, which is not significant at the .05 level.

Europe to East Coast/HHG/Breakbulk

1.	117.	.117
2.	85.	.085
3.	269.	.269
4.	91.	.091
5.	46.	.046
6.	97.	.096
7.	173.	.173
8.	85.	.085
9.	1983.	1.983
10.	3438.	3.438
11.	2483.	2.483
12.	2411.	2.411
13.	1811.	1.811
14.	516.	.516
15.	2933.	2.933
16.	774.	.774
17.	1547.	1.547
18.	2876.	2.876
19.	1074.	1.074
20.	2370.	2.370
21.	3396.	3.396
22.	2056.	2.056
23.	4935.	4.935
24.	761.	.761
25.	2513.	2.513
26.	1823.	1.823
27.	962.	.962
28.	388.	.388
29.	1375.	1.375
30.	2897.	2.897
31.	682.	.682
32.	1122.	1.122
33.	2723.	2.723
34.	3510.	3.510
35.	2730.	2.730
36.	1459.	1.459
37.	1395.	1.395
38.	1809.	1.809
39.	2241.	2.241
40.	1630.	1.630
41.	1456.	1.456
42.	1334.	1.334
43.	1165.	1.165
44.	1188.	1.188
45.	2625.	2.625
46.	816.	.816
47.	1334.	1.334
48.	1993.	1.993
49.	1312.	1.312
50.	1553.	1.553
51.	1474.	1.474
52.	1381.	1.381
53.	855.	.855
54.	3358.	3.358
55.	1896.	1.896
56.	988.	.988
57.	1869.	1.869
58.	1399.	1.399
59.	2859.	2.859
60.	1915.	1.915
61.	664.	.664
62.	729.	.729
63.	2311.	2.311
64.	1310.	1.310
65.	942.	.942
66.	2227.	2.227
67.	937.	.937
68.	2456.	2.456
69.	1142.	1.142
70.	3445.	3.445
71.	2344.	2.344
72.	3586.	3.586

Europe to East Coast/HHG/Breakbulk

```
TIME      DIFFERENCES
                    1          12
1-   72   (1-B    ) (1-B    )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6705	.1100	6.10
2	TRANS	MA	2	12	.8465	.0522	16.21
3	TRANS	AR	1	1	-.3121	.1388	-2.25

FORECASTS

85 10	1.77057	1.17524
85 11	1.19663	1.23539
85 12	1.61701	1.26419
86 1	1.23615	1.30010
86 2	1.24014	1.33259
86 3	2.01313	1.36504
86 4	1.31177	1.39652
86 5	1.51513	1.42737
86 6	2.64095	1.45755
86 7	3.33454	1.48712
86 8	3.15141	1.51611
86 9	2.63463	1.56891

SUM OF 12 FORECASTS = 23.86

The observed value for the Box-Pierce chi square is 18.62 with 20 degrees of freedom, which is not significant at the .05 level. The model was built on data beginning at 10-78. The tonnage value for month 08-84 was changed from 0 to 2344.

Europe to East Coast/HHG/Container

1.	667.	.667
2.	690.	.690
3.	349.	.349
4.	597.	.597
5.	442.	.442
6.	668.	.668
7.	318.	.318
8.	568.	.568
9.	517.	.517
10.	466.	.466
11.	285.	.285
12.	55.	.055
13.	667.	.667
14.	667.	.667
15.	667.	.667
16.	667.	.667
17.	667.	.667
18.	142.	.142
19.	126.	.126
20.	358.	.358
21.	280.	.280
22.	226.	.226
23.	331.	.331
24.	983.	.983
25.	591.	.591
26.	915.	.915
27.	900.	.900
28.	201.	.201
29.	373.	.373
30.	274.	.274
31.	204.	.204
32.	403.	.403
33.	920.	.920
34.	1639.	1.639
35.	1118.	1.118
36.	543.	.543
37.	530.	.530
38.	763.	.763
39.	442.	.442
40.	443.	.443
41.	401.	.401
42.	424.	.424
43.	350.	.350
44.	489.	.489
45.	768.	.768
46.	1110.	1.110
47.	1036.	1.036
48.	581.	.581
49.	570.	.570
50.	500.	.500
51.	727.	.727
52.	484.	.484
53.	943.	.943
54.	697.	.697
55.	340.	.340
56.	166.	.166
57.	338.	.338
58.	566.	.566
59.	211.	.211
60.	321.	.321

Europe to East Coast/HHG/Container

TIME DIFFERENCES

12

1- 6U (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	-.2776	.1456	-1.91
2	TRANS	MA	1	6	.4671	.1184	3.95
3	TRANS	MA	2	12	.7687	.0773	9.94
4	TRANS	AR	1	1	.2896	.1748	1.66

FORECASTS

85	10	.60055	.38472
85	11	.88620	.38863
85	12	.54733	.38895
86	1	.58791	.38898
86	2	.57272	.38898
86	3	.52447	.41907
86	4	.29391	.42155
86	5	.41661	.42179
86	6	.55058	.42172
86	7	.73876	.42172
86	8	.57020	.42172
86	9	.38139	.42675

SUM OF 12 FORECASTS = 6.62

The observed value for the Box-Pierce chi square is 17.72 with 20 degrees of freedom, which is not significant at the .05 level. The data series for which the model is based begins 10-79. Tonnages for 11-81, 12-81, 10-83, and 11-83 were changed from 1815, 51, 1124, 230 to 915, 900, 570, and 500, respectively.

Europe to East Coast/CONEX/Breakbulk

1.	192.	.192
2.	3808.	3.808
3.	5163.	5.163
4.	2822.	2.822
5.	43.	.043
6.	2304.	2.304
7.	7414.	7.414
8.	0.	.000
9.	5046.	5.046
10.	5089.	5.089
11.	0.	.000
12.	92.	.092
13.	320.	.320
14.	0.	.000
15.	3690.	3.690
16.	4268.	4.268
17.	0.	.000
18.	0.	.000
19.	43.	.043
20.	1558.	1.558
21.	0.	.000
22.	0.	.000
23.	4832.	4.832
24.	118.	.118
25.	4928.	4.928
26.	5792.	5.792
27.	2260.	2.260
28.	20.	.021
29.	672.	.672
30.	110.	.110
31.	139.	.139
32.	1920.	1.920
33.	9462.	9.462
34.	8.	.008
35.	20.	.021
36.	2921.	2.921
37.	0.	.000
38.	2400.	2.400
39.	1920.	1.920
40.	0.	.000
41.	0.	.000
42.	160.	.160
43.	6560.	6.560
44.	0.	.000
45.	5405.	5.405
46.	800.	.800
47.	1024.	1.024
48.	13262.	13.262
49.	41.	.041
50.	0.	.000
51.	64.	.064
52.	6144.	6.144
53.	32.	.032
54.	4896.	4.896
55.	1921.	1.921
56.	6242.	6.242
57.	0.	.000
58.	2916.	2.916
59.	4672.	4.672
60.	2400.	2.400
61.	2656.	2.656
62.	0.	.000
63.	6080.	6.080
64.	5248.	5.248
65.	0.	.000
66.	9216.	9.216
67.	7072.	7.072
68.	21852.	21.852
69.	3648.	3.648
70.	0.	.000
71.	448.	.448
72.	7584.	7.584

Europe to East Coast/CONEX/Breakbulk

TIME DIFFERENCES

1- 72 $(1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9018	.0638	14.14
2	TRANS	MA	2	12	.6954	.0794	8.76
3	TRANS	AR	1	1	-.1046	.1385	-.75

FORECASTS		
85 10	2.93863	4.92092
85 11	2.52761	4.94491
85 12	4.50665	4.96376
86 1	4.68261	4.98305
86 2	1.10103	5.00220
86 3	5.27194	5.02129
86 4	5.76869	5.04030
86 5	9.30382	5.05925
86 6	4.71550	5.07812
86 7	2.58233	5.09692
86 8	2.64150	5.11566
86 9	5.60663	5.46981

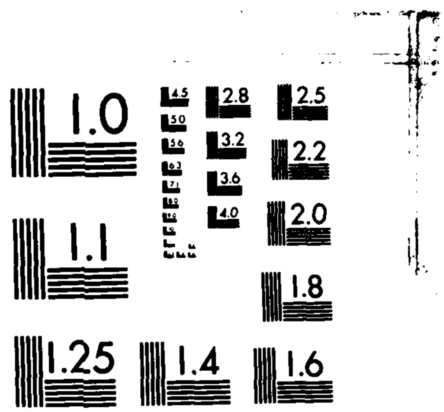
SUM OF 12 FORECASTS = 51.65

The observed value for the Box-Pierce chi square is 17.03 with 20 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins 10-78.

Europe to East Coast/Special/Breakbulk

1.	28784.	28.784
2.	2179.	2.179
3.	1009.	1.009
4.	461.	.461
5.	275.	.275
6.	1628.	1.628
7.	1246.	1.246
8.	409.	.409
9.	416.	.416
10.	2539.	2.539
11.	522.	.522
12.	652.	.652
13.	1503.	1.503
14.	1014.	1.014
15.	92.	.092
16.	174.	.174
17.	1115.	1.115
18.	89.	.089
19.	2662.	2.662
20.	1826.	1.826
21.	1496.	1.496
22.	504.	.504
23.	1423.	1.423
24.	941.	.941
25.	2313.	2.313
26.	1536.	1.536
27.	128.	.128
28.	1988.	1.988
29.	0.	.000
30.	2172.	2.172
31.	378.	.378
32.	526.	.526
33.	1703.	1.703
34.	269.	.269
35.	1399.	1.399
36.	390.	.390
37.	847.	.847
38.	41.	.041
39.	0.	.000
40.	488.	.488
41.	1142.	1.142
42.	3287.	3.287
43.	397.	.397
44.	375.	.375
45.	892.	.892
46.	85.	.085
47.	248.	.248
48.	427.	.427
49.	291.	.291
50.	106.	.106
51.	0.	.000
52.	182.	.182
53.	348.	.348
54.	113.	.113
55.	45.	.045
56.	362.	.362
57.	693.	.693
58.	146.	.146
59.	469.	.469
60.	1362.	1.362
61.	206.	.206
62.	6636.	6.636
63.	6087.	6.087
64.	8036.	8.036
65.	45.	.045
66.	623.	.623
67.	62.	.062
68.	32.	.032
69.	388.	.388
70.	158.	.158
71.	597.	.597
72.	180.	.180
73.	10036.	10.036
74.	157.	.157
75.	519.	.519
76.	94.	.094
77.	219.	.219
78.	0.	.000
79.	79.	.079
80.	79.	.079
81.	272.	.272
82.	557.	.557
83.	0.	.000
84.	283.	.283

AD-A160 430 TRANSPORTATION WORKLOAD FORECASTING STUDY - 3/4
IMPLEMENTATION (TWFS-I)(U) ARMY CONCEPTS ANALYSIS
AGENCY BETHESDA MD H D FREAR ET AL AUG 85
UNCLASSIFIED CAA-SR-85-11 F/G 15/5 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Europe to East Coast/Special/Breakbulk

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TIME      DIFFERENCES
                1        12
1-  84   (1-B   ) (1-B   )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	-.4177	.3098	-1.35
2	TRANS	MA	2	12	.6811	.0938	7.26
3	TRANS	AR	1	1	-.6080	.2729	-2.23
4	TRANS	AR	2	12	.4702	.1405	3.35

FORECASTS		
85 10	7.59182	4.50258
85 11	.23281	5.54613
85 12	1.46857	6.30176
86 1	.73705	7.04150
86 2	.79198	7.67398
86 3	.31461	8.27875
86 4	.67161	8.83050
86 5	.56189	9.35648
86 6	.80879	9.85053
86 7	.64585	10.32322
86 8	.54313	10.77388
86 9	.41297	12.25850

SUM OF 12 FORECASTS = 14.76

The observed value for the Box-Pierce chi square is 8.35 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/Chill/Container

1.	172.	.172
2.	133.	.133
3.	239.	.239
4.	262.	.262
5.	245.	.245
6.	463.	.463
7.	234.	.234
8.	415.	.415
9.	83.	.083
10.	429.	.429
11.	291.	.291
12.	315.	.315
13.	193.	.193
14.	280.	.280
15.	257.	.257
16.	325.	.325
17.	314.	.314
18.	240.	.240
19.	337.	.337
20.	652.	.652
21.	161.	.161
22.	400.	.400
23.	454.	.454
24.	167.	.167
25.	252.	.252
26.	243.	.243
27.	298.	.298
28.	186.	.186
29.	676.	.676
30.	419.	.419
31.	246.	.246
32.	308.	.308
33.	197.	.197
34.	659.	.659
35.	325.	.325
36.	295.	.295
37.	192.	.192
38.	336.	.336
39.	103.	.103
40.	197.	.197
41.	236.	.236
42.	236.	.236
43.	272.	.272
44.	235.	.235
45.	412.	.412
46.	298.	.298
47.	194.	.194
48.	348.	.348
49.	350.	.350
50.	113.	.113
51.	295.	.295
52.	438.	.438
53.	215.	.215
54.	626.	.626
55.	705.	.705
56.	369.	.369
57.	295.	.295
58.	157.	.157
59.	275.	.275
60.	139.	.139
61.	60.	.060
62.	100.	.100
63.	242.	.242
64.	398.	.398
65.	225.	.225
66.	186.	.186
67.	206.	.206
68.	251.	.251
69.	361.	.361
70.	405.	.405
71.	299.	.299
72.	329.	.329
73.	210.	.210
74.	130.	.130
75.	361.	.361
76.	253.	.253
77.	321.	.321
78.	456.	.456
79.	271.	.271
80.	307.	.307
81.	247.	.247
82.	363.	.363
83.	212.	.212
84.	236.	.236

California Coast to Korea/Chill/Container

TIME DIFFERENCES

$$1\text{-}\ 84 \quad (1-B^{1})\ (1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8795	.0528	16.64
2	TRANS	MA	2	12	.8813	.0512	17.22

FORECASTS		
85 10	.19312	.15198
85 11	.16426	.15307
85 12	.25665	.15414
86 1	.28798	.15521
86 2	.28691	.15628
86 3	.41577	.15733
86 4	.29262	.15839
86 5	.37679	.15942
86 6	.19411	.16045
86 7	.40095	.16148
86 8	.28898	.16250
86 9	.29151	.16646

SUM OF 12 FORECASTS = 3.45

The observed value for the Box-Pierce chi square is 28.07 with 21 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/Freeze/Container

1.	372.	.372
2.	301.	.301
3.	294.	.294
4.	236.	.236
5.	212.	.212
6.	313.	.313
7.	374.	.374
8.	416.	.416
9.	157.	.157
10.	478.	.478
11.	196.	.196
12.	343.	.343
13.	247.	.247
14.	268.	.268
15.	304.	.304
16.	174.	.174
17.	299.	.299
18.	222.	.222
19.	483.	.483
20.	457.	.457
21.	188.	.188
22.	256.	.256
23.	403.	.403
24.	103.	.103
25.	246.	.246
26.	144.	.144
27.	245.	.245
28.	129.	.129
29.	340.	.340
30.	358.	.358
31.	314.	.314
32.	334.	.334
33.	281.	.281
34.	143.	.143
35.	456.	.456
36.	262.	.262
37.	309.	.309
38.	307.	.307
39.	229.	.229
40.	481.	.481
41.	239.	.239
42.	240.	.240
43.	369.	.369
44.	352.	.352
45.	333.	.333
46.	372.	.372
47.	318.	.318
48.	280.	.280
49.	414.	.414
50.	286.	.286
51.	241.	.241
52.	376.	.376
53.	278.	.278
54.	743.	.743
55.	663.	.663
56.	918.	.918
57.	588.	.588
58.	351.	.351
59.	281.	.281
60.	58.	.058
61.	95.	.095
62.	30.	.030
63.	201.	.201
64.	393.	.393
65.	240.	.240
66.	281.	.281
67.	320.	.320
68.	213.	.213
69.	322.	.322
70.	316.	.316
71.	325.	.325
72.	312.	.312
73.	285.	.285
74.	336.	.336
75.	173.	.173
76.	151.	.151
77.	301.	.301
78.	406.	.406
79.	399.	.399
80.	181.	.181
81.	319.	.319
82.	462.	.462
83.	348.	.348
84.	147.	.147

California Coast to Korea/Freeze/Container

TIME DIFFERENCES

$1 - B^{1}$ ... 1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	6	.2864	.1080	2.65
2	TRANS	AR	1	1	-.4353	.1015	-4.29

FORECASTS

85	10	.34013	.15488
85	11	.40681	.18530
85	12	.37521	.20625
86	1	.33634	.22726
86	2	.35718	.24568
86	3	.34811	.25189
86	4	.35206	.26199
86	5	.35034	.26991
86	6	.35109	.27834
86	7	.35076	.28620
86	8	.35090	.29400
86	9	.35084	.30153

SUM OF 12 FORECASTS = 4.27 SUM

The observed value for the Box-Pierce chi square is 14.98 with 33 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/POV/Container

1.	83.	.083
2.	120.	.120
3.	122.	.122
4.	76.	.076
5.	184.	.184
6.	108.	.108
7.	160.	.160
8.	243.	.243
9.	197.	.197
10.	234.	.234
11.	370.	.370
12.	88.	.088
13.	155.	.155
14.	328.	.328
15.	464.	.464
16.	131.	.131
17.	258.	.258
18.	143.	.143
19.	118.	.118
20.	88.	.088
21.	68.	.068
22.	0.	.000
23.	134.	.134
24.	321.	.321
25.	453.	.453
26.	641.	.641
27.	726.	.726
28.	325.	.325
29.	417.	.417
30.	366.	.366
31.	298.	.298
32.	313.	.313
33.	171.	.171
34.	265.	.265
35.	293.	.293
36.	335.	.335
37.	695.	.695
38.	487.	.487
39.	352.	.352
40.	492.	.492
41.	409.	.409
42.	389.	.389
43.	386.	.386
44.	428.	.428
45.	448.	.448
46.	301.	.301
47.	397.	.397
48.	501.	.501
49.	745.	.745
50.	1070.	1.070
51.	674.	.674
52.	875.	.875
53.	474.	.474
54.	274.	.274
55.	347.	.347
56.	239.	.239
57.	112.	.112
58.	191.	.191
59.	177.	.177
60.	338.	.338
61.	434.	.434
62.	499.	.499
63.	402.	.402
64.	311.	.311
65.	370.	.370
66.	293.	.293
67.	225.	.225
68.	354.	.354
69.	257.	.257
70.	284.	.284
71.	214.	.214
72.	335.	.335
73.	722.	.722
74.	633.	.633
75.	426.	.426
76.	363.	.363

California Coast to Korea/POV/Container

TIME DIFFERENCES

$1- 76\ (1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.4640	.1053	4.41
2	TRANS	MA	2	12	.8974	.0510	17.60
3	TRANS	AR	1	4	-.1087	.1139	-.95

FORECASTS		
85 10	.33221	.22209
85 11	.26508	.24562
85 12	.30617	.26709
86 1	.36659	.27988
86 2	.30994	.29509
86 3	.33022	.30955
86 4	.41804	.32337
86 5	.30458	.33727
86 6	.44724	.35033
86 7	.56936	.36291
86 8	.58100	.37508
86 9	.36765	.39219

SUM OF 12 FORECASTS = 4.60

The observed value for the Box-Pierce chi square is 17.90 with 20 degrees of freedom, which is not significant at the .05 level. The data series for this model begins at 06-78.

California Coast to Korea/Ammunition/Breakbulk

1.	1585.	1.585
2.	25.	.025
3.	0.	.000
4.	0.	.000
5.	1.	.001
6.	0.	.000
7.	0.	.000
8.	0.	.000
9.	1753.	1.753
10.	0.	.000
11.	5103.	5.103
12.	2.	.002
13.	0.	.000
14.	1.	.001
15.	5683.	5.683
16.	1.	.001
17.	7594.	7.594
18.	0.	.000
19.	9151.	9.151
20.	0.	.000
21.	9201.	9.201
22.	0.	.000
23.	0.	.000
24.	7836.	7.836
25.	0.	.000
26.	0.	.000
27.	0.	.000
28.	0.	.000
29.	8240.	8.240
30.	12.	.012
31.	0.	.000
32.	9520.	9.520
33.	16199.	16.199
34.	35.	.035
35.	0.	.000
36.	1148.	1.148
37.	20.	.020
38.	0.	.000
39.	0.	.000
40.	1.	.001
41.	10120.	10.120
42.	8968.	8.968
43.	0.	.000
44.	5561.	5.561
45.	5519.	5.519
46.	0.	.000
47.	6548.	6.548
48.	0.	.000
49.	1.	.001
50.	2.	.002
51.	7067.	7.067
52.	5592.	5.592
53.	5970.	5.970
54.	0.	.000
55.	6122.	6.122
56.	4.	.004
57.	652.	.652
58.	0.	.000
59.	6431.	6.431
60.	1.	.001
61.	0.	.000
62.	6602.	6.602
63.	0.	.000
64.	7729.	7.729
65.	8357.	8.357
66.	9064.	9.064
67.	0.	.000
68.	0.	.000
69.	7363.	7.363
70.	6.	.006
71.	0.	.000
72.	1547.	1.547
73.	5.	.005
74.	22.	.022
75.	761.	.761
76.	1.	.001
77.	0.	.000
78.	1.	.001
79.	3327.	3.327
80.	0.	.000
81.	0.	.000

California Coast to Korea/Ammunition/Breakbulk

```
                TIME     DIFFERENCES
                              1
                1-  81  (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9757	.0138	70.46

FORECASTS

85 10	2.29842	3.80214
85 11	2.29842	3.80326
85 12	2.29842	3.80438
86 1	2.29842	3.80550
86 2	2.29842	3.80662
86 3	2.29842	3.80774
86 4	2.29842	3.80885
86 5	2.29842	3.80997
86 6	2.29842	3.81109
86 7	2.29842	3.81220
86 8	2.29842	3.81332
86 9	2.29842	3.81443

SUM OF 12 FORECASTS = 27.58

The observed value for the Box-Pierce chi square is 25.33 with 34 degrees of freedom, which is not significant at the .05 level. The data series used for this model begins at 01-78.

California Coast to Korea/Ammunition/Container

1.	6.	.006
2.	3.	.003
3.	0.	.000
4.	4.	.004
5.	9.	.009
6.	14.	.014
7.	5.	.005
8.	22.	.022
9.	8.	.008
10.	28.	.028
11.	0.	.000
12.	1.	.001
13.	0.	.000
14.	5.	.005
15.	4.	.004
16.	17.	.017
17.	7.	.007
18.	22.	.022
19.	41.	.041
20.	179.	.179
21.	0.	.000
22.	46.	.046
23.	27.	.027
24.	14.	.014
25.	10.	.010
26.	3.	.003
27.	4.	.004
28.	0.	.000
29.	57.	.057
30.	49.	.050
31.	39.	.038
32.	113.	.113
33.	12.	.012
34.	1.	.001
35.	0.	.000
36.	15.	.015
37.	0.	.000
38.	22.	.022
39.	58.	.056
40.	23.	.023
41.	11.	.010
42.	133.	.133
43.	57.	.057
44.	2.	.002
45.	1.	.001
46.	0.	.000
47.	22.	.022
48.	0.	.000
49.	27.	.027
50.	38.	.038
51.	29.	.029
52.	4.	.004
53.	0.	.000
54.	11.	.011
55.	29.	.029
56.	0.	.000
57.	1.	.001
58.	18.	.018
59.	16.	.016
60.	13.	.013
61.	7.	.007
62.	19.	.019
63.	7.	.007
64.	7.	.007
65.	0.	.000
66.	1.	.001
67.	2.	.002
68.	17.	.017
69.	47.	.047
70.	8.	.008
71.	21.	.021
72.	3.	.003
73.	28.	.028
74.	3.	.003
75.	1.	.001
76.	32.	.033
77.	1.	.001
78.	1.	.001
79.	0.	.000
80.	0.	.000
81.	2.	.002
82.	1.	.001
83.	1.	.001
84.	1.	.001

California Coast to Korea/Ammunition/Container

TIME DIFFERENCES

$1- \quad 84 \quad (1-B)^{1}$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9432	.0357	26.44
2	TRANS	MA	2	12	-.4488	.0951	-4.72

FORECASTS

85	10	.01933	.02773
85	11	.00590	.02777
85	12	.00523	.02782
86	1	.01824	.02786
86	2	.00686	.02791
86	3	.00239	.02795
86	4	.00609	.02800
86	5	.00304	.02304
86	6	-.00254	.02808
86	7	.00592	.02813
86	8	.00224	.02817
86	9	.00330	.03146

SUM OF 12 FORECASTS = .08

The observed value for the Box-Pierce chi square is 34.00 with 33 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/General/Breakbulk

1.	272.	.272
2.	148.	.148
3.	136.	.136
4.	491.	.491
5.	496.	.496
6.	103.	.103
7.	170.	.170
8.	656.	.656
9.	196.	.196
10.	86.	.086
11.	726.	.726
12.	551.	.551
13.	159.	.159
14.	329.	.329
15.	314.	.314
16.	456.	.456
17.	215.	.215
18.	347.	.347
19.	989.	.989
20.	163.	.163
21.	632.	.632
22.	703.	.703
23.	129.	.129
24.	533.	.533
25.	501.	.501
26.	270.	.270
27.	137.	.137
28.	247.	.247
29.	197.	.197
30.	407.	.407
31.	142.	.142
32.	125.	.125
33.	166.	.166
34.	134.	.134
35.	7.	.007
36.	495.	.495
37.	868.	.868
38.	316.	.316
39.	160.	.160
40.	121.	.121
41.	119.	.119
42.	510.	.510
43.	170.	.170
44.	312.	.312
45.	204.	.204
46.	129.	.129
47.	244.	.244
48.	201.	.201
49.	0.	.000
50.	370.	.370
51.	456.	.456
52.	261.	.261
53.	491.	.491
54.	369.	.369
55.	343.	.343
56.	1516.	1.516
57.	0.	.000
58.	1028.	1.028
59.	558.	.558
60.	250.	.250
61.	2193.	2.193
62.	160.	.160
63.	209.	.209
64.	503.	.503
65.	253.	.253
66.	82.	.082
67.	682.	.682
68.	308.	.308
69.	324.	.324
70.	174.	.174
71.	1928.	1.928
72.	278.	.278
73.	151.	.151
74.	70.	.070
75.	67.	.066
76.	184.	.184
77.	519.	.519
78.	229.	.229
79.	259.	.259
80.	325.	.325
81.	1283.	1.283
82.	459.	.459
83.	507.	.507
84.	615.	.615

California Coast to Korea/General/Breakbulk

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TIME      DIFFERENCES
                   1        12
1-  84  (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8780	.0549	15.99
2	TRANS	MA	2	12	.8310	.1038	8.01
3	TRANS	AR	1	1	-.2487	.1009	-2.47
4	TRANS	AR	2	12	-.2581	.1543	-1.67

FORLCASTS

85 10	.89566	.46351
85 11	.39906	.46909
85 12	.41729	.49074
86 1	.52446	.49313
86 2	.38016	.49532
86 3	.44202	.49754
86 4	.74935	.49974
86 5	.57589	.50193
86 6	.40043	.50412
86 7	.60913	.50629
86 8	.68256	.50845
86 9	.53026	.50847

SUM OF 12 FORECASTS = 6.61

The observed value for the Box-Pierce chi square is 15.17 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/General/Container

1.	10641.	10.641
2.	15032.	15.032
3.	16299.	16.299
4.	16724.	16.724
5.	13931.	13.931
6.	17375.	17.375
7.	19681.	19.681
8.	19516.	19.516
9.	19736.	19.736
10.	16712.	16.712
11.	13966.	13.966
12.	19106.	19.106
13.	15125.	15.126
14.	16049.	16.049
15.	12437.	12.437
16.	14683.	14.683
17.	13403.	13.403
18.	16868.	16.868
19.	17589.	17.589
20.	24334.	24.334
21.	19945.	19.945
22.	21965.	21.965
23.	14595.	14.595
24.	11571.	11.571
25.	11250.	11.250
26.	11593.	11.593
27.	17011.	17.011
28.	13970.	13.970
29.	17101.	17.101
30.	12175.	12.175
31.	16414.	16.414
32.	14128.	14.128
33.	13600.	13.600
34.	16947.	16.947
35.	14356.	14.356
36.	12082.	12.082
37.	8256.	8.256
38.	10705.	10.705
39.	11188.	11.108
40.	10067.	10.067
41.	11118.	11.118
42.	15749.	15.749
43.	14764.	14.764
44.	13622.	13.622
45.	13390.	13.390
46.	10821.	10.821
47.	12118.	12.118
48.	13665.	13.665
49.	11132.	11.132
50.	17273.	17.273
51.	17985.	17.985
52.	13162.	13.162
53.	11901.	11.901
54.	16048.	18.048
55.	21945.	21.945
56.	17680.	17.680
57.	19615.	19.615
58.	14200.	14.200
59.	13148.	13.148
60.	16552.	16.552
61.	11129.	11.129
62.	15067.	15.067
63.	13226.	13.226
64.	12072.	12.072
65.	13110.	13.110
66.	16516.	16.516
67.	13664.	13.664
68.	14996.	14.996
69.	13437.	13.437
70.	13495.	13.495
71.	14238.	14.238
72.	11155.	11.155
73.	16387.	16.387
74.	15178.	15.178
75.	16552.	16.552
76.	12947.	12.947
77.	13331.	13.331
78.	14149.	14.149
79.	12794.	12.794
80.	16001.	16.001
81.	15058.	15.058
82.	12876.	12.876
83.	15747.	15.747
84.	10566.	10.566

California Coast to Korea/General/Container

TIME DIFFERENCES

$$1\text{-}\ 84\quad (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6961	.0791	8.80
2	TRANS	MA	2	12	.8420	.0401	21.01
3	TRANS	AR	1	4	-.2193	.1110	-1.97

FORECASTS

85	10	12.44049	3.39029
85	11	14.19378	3.53071
85	12	12.15311	3.66576
86	1	12.16278	3.67603
86	2	11.99629	3.75575
86	3	15.02443	3.83360
86	4	16.59032	3.91030
86	5	16.61013	4.01837
86	6	16.08014	4.10059
86	7	14.16226	4.16121
86	8	12.90856	4.26030
86	9	14.34892	4.45289

SUM OF 12 FORECASTS = 168.67

The observed value for the Box-Pierce chi square is 17.69 with 20 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/HHG/Container

1.	91.	.091
2.	234.	.234
3.	272.	.272
4.	181.	.181
5.	30.	.030
6.	64.	.064
7.	14.	.014
8.	69.	.069
9.	739.	.739
10.	1148.	1.148
11.	1249.	1.249
12.	538.	.538
13.	302.	.302
14.	37.	.037
15.	58.	.058
16.	54.	.054
17.	7.	.007
18.	31.	.031
19.	87.	.087
20.	97.	.097
21.	129.	.129
22.	240.	.240
23.	170.	.170
24.	286.	.286
25.	163.	.163
26.	53.	.053
27.	105.	.105
28.	141.	.141
29.	96.	.096
30.	13.	.013
31.	129.	.129
32.	162.	.162
33.	71.	.071
34.	206.	.206
35.	142.	.142
36.	177.	.177
37.	22.	.022
38.	89.	.089
39.	76.	.076
40.	86.	.086
41.	120.	.120
42.	139.	.139
43.	111.	.111
44.	130.	.130
45.	457.	.457
46.	174.	.174
47.	222.	.222
48.	322.	.322
49.	120.	.120
50.	331.	.331
51.	177.	.177
52.	159.	.159
53.	124.	.124
54.	327.	.327
55.	110.	.110
56.	373.	.373
57.	680.	.680
58.	549.	.549
59.	218.	.218
60.	398.	.398
61.	227.	.227
62.	230.	.230
63.	204.	.204
64.	250.	.250
65.	145.	.145
66.	134.	.134
67.	49.	.049
68.	183.	.183
69.	307.	.307
70.	381.	.381
71.	409.	.409
72.	53.	.053
73.	134.	.134
74.	215.	.215
75.	122.	.122
76.	79.	.079
77.	113.	.113
78.	178.	.178
79.	118.	.118
80.	71.	.071
81.	127.	.127
82.	78.	.078
83.	87.	.087
84.	57.	.057

California Coast to Korea/HHG/Container

TIME DIFFERENCES

$$1\text{-}\ 84\quad (1-B^{1})\,(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8368	.0924	9.06
2	TRANS	MA	2	12	.7304	.0694	10.52
3	TRANS	AR	1	1	.5450	.1275	4.27
4	TRANS	AR	2	12	-.1532	.0907	-1.69

FORECASTS

85	10	.02981	.16928
85	11	.04983	.16550
85	12	.03058	.19620
86	1	.04289	.20441
86	2	.00501	.21137
86	3	.04900	.21764
86	4	.00352	.22350
86	5	.08570	.22907
86	6	.23726	.23445
86	7	.24023	.23967
86	8	.17848	.24476
86	9	.15057	.25342

SUM OF 12 FORECASTS = 1.10

The observed value for the Box-Pierce chi square is 19.45 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Korea/CONEX/Container

1.	2.	.002
2.	0.	.000
3.	0.	.000
4.	1.	.001
5.	0.	.000
6.	0.	.000
7.	0.	.000
8.	5.	.005
9.	0.	.000
10.	7.	.007
11.	0.	.000
12.	0.	.000
13.	0.	.000
14.	0.	.000
15.	0.	.000
16.	0.	.000
17.	14.	.014
18.	2.	.002
19.	7.	.007
20.	0.	.000
21.	0.	.000
22.	3.	.003
23.	0.	.000
24.	4.	.004
25.	0.	.000
26.	0.	.000
27.	0.	.000
28.	2.	.002
29.	0.	.000
30.	0.	.000
31.	4.	.004
32.	1.	.001
33.	0.	.000
34.	0.	.000
35.	0.	.000
36.	143.	.143
37.	17.	.017
38.	1.	.001
39.	0.	.000
40.	0.	.000
41.	0.	.000
42.	0.	.000
43.	3.	.003
44.	0.	.000
45.	8.	.008
46.	2.	.002
47.	0.	.000
48.	1.	.001
49.	43.	.043
50.	0.	.000
51.	31.	.031
52.	1.	.001
53.	0.	.000
54.	3.	.003
55.	1.	.001
56.	56.	.056
57.	3.	.003
58.	1.	.001
59.	0.	.000
60.	2.	.002
61.	1.	.001
62.	0.	.000
63.	1.	.001
64.	4.	.004
65.	16.	.016
66.	9.	.009
67.	33.	.033
68.	146.	.146
69.	0.	.000
70.	1.	.001
71.	2.	.002
72.	9.	.009
73.	2.	.002
74.	19.	.019
75.	11.	.011
76.	2.	.002
77.	0.	.000
78.	1.	.001
79.	3.	.003
80.	6.	.006
81.	7.	.007
82.	148.	.148
83.	14.	.014

California Coast to Korea/CONEX/Container

TIME DIFFERENCES
12
1- 83 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	-.1282	.1182	-1.08
2	TRANS	MA	2	12	.8011	.0467	17.15

FORECASTS

85 10	.01708	.03191
85 11	.00822	.03191
85 12	.00392	.03191
86 1	.00618	.03191
86 2	.00167	.03191
86 3	.00359	.03191
86 4	.00209	.03191
86 5	.00691	.03191
86 6	.03291	.03191
86 7	.00260	.03191
86 8	.03206	.03191
86 9	.00407	.03253

SUM OF 12 FORECASTS = .12

The observed value for the Box-Pierce chi square is 17.72 with 20 degrees of freedom, which is not significant at the .05 level. The data series for the model generated starts at 11-77.

California Coast to Korea/Special/Breakbulk

1.	272.	.272
2.	148.	.148
3.	136.	.136
4.	491.	.491
5.	496.	.496
6.	103.	.103
7.	170.	.170
8.	656.	.656
9.	198.	.198
10.	86.	.086
11.	726.	.726
12.	551.	.551
13.	159.	.159
14.	329.	.329
15.	314.	.314
16.	456.	.456
17.	215.	.215
18.	347.	.347
19.	989.	.989
20.	163.	.163
21.	632.	.632
22.	703.	.703
23.	129.	.129
24.	533.	.533
25.	501.	.501
26.	270.	.270
27.	137.	.137
28.	247.	.247
29.	197.	.197
30.	407.	.407
31.	142.	.142
32.	125.	.125
33.	166.	.166
34.	134.	.134
35.	7.	.007
36.	495.	.495
37.	868.	.868
38.	316.	.316
39.	160.	.160
40.	121.	.121
41.	119.	.119
42.	510.	.510
43.	170.	.170
44.	312.	.312
45.	204.	.204
46.	129.	.129
47.	244.	.244
48.	201.	.201
49.	0.	.000
50.	370.	.370
51.	456.	.456
52.	261.	.261
53.	491.	.491
54.	369.	.369
55.	343.	.343
56.	1516.	1.516
57.	0.	.000
58.	1028.	1.028
59.	558.	.558
60.	250.	.250
61.	2193.	2.193
62.	160.	.160
63.	209.	.209
64.	503.	.503
65.	253.	.253
66.	82.	.082
67.	682.	.682
68.	308.	.308
69.	324.	.324
70.	174.	.174
71.	1928.	1.928
72.	278.	.278
73.	151.	.151
74.	70.	.070
75.	67.	.066
76.	184.	.184
77.	519.	.519
78.	229.	.229
79.	259.	.259
80.	325.	.325
81.	1283.	1.283
82.	459.	.459
83.	507.	.507
84.	615.	.615

California Coast to Korea/Special/Breakbulk

TIME	DIFFERENCES
1- 84	$(1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8780	.0549	15.99
2	TRANS	MA	2	12	.8310	.1038	8.01
3	TRANS	AR	1	1	-.2487	.1009	-2.47
4	TRANS	AR	2	12	-.2581	.1543	-1.67

FORECASTS		
85 10	.89566	.48351
85 11	.39906	.48909
85 12	.41729	.49374
86 1	.52446	.49313
86 2	.38016	.49532
86 3	.44202	.49754
86 4	.74935	.49974
86 5	.57589	.50193
86 6	.40043	.50412
86 7	.60913	.50629
86 8	.68256	.50845
86 9	.53026	.50847

SUM OF 12 FORECASTS = 6.61

The observed value for the Box-Pierce chi square is 15.17 with 19 degrees of freedom; this is significant at the .05 level.

California Coast to Korea/Special/Container

1.	18.	.016
2.	32.	.032
3.	12.	.012
4.	14.	.014
5.	9.	.009
6.	11.	.011
7.	15.	.015
8.	118.	.118
9.	49.	.049
10.	373.	.373
11.	1.	.001
12.	22.	.022
13.	285.	.285
14.	6.	.006
15.	22.	.022
16.	13.	.013
17.	0.	.000
18.	421.	.421
19.	75.	.075
20.	53.	.053
21.	81.	.081
22.	88.	.088
23.	18.	.016
24.	117.	.117
25.	2.	.002
26.	53.	.053
27.	89.	.089
28.	97.	.097
29.	5.	.005
30.	51.	.052
31.	77.	.077
32.	181.	.181
33.	121.	.121
34.	113.	.113
35.	57.	.056
36.	333.	.333
37.	47.	.047
38.	101.	.101
39.	145.	.145
40.	582.	.582
41.	341.	.341
42.	8.	.008
43.	58.	.058
44.	61.	.061
45.	126.	.126
46.	84.	.084
47.	85.	.085
48.	329.	.329
49.	218.	.218
50.	10.	.010
51.	419.	.419
52.	380.	.380
53.	46.	.046
54.	18.	.018
55.	58.	.058
56.	90.	.090
57.	171.	.171
58.	2.	.002
59.	24.	.024
60.	2.	.002
61.	3.	.003
62.	41.	.041
63.	23.	.023
64.	22.	.022
65.	2.	.002
66.	6.	.006
67.	204.	.204
68.	37.	.037
69.	10.	.010
70.	40.	.040
71.	52.	.052
72.	11.	.011
73.	370.	.370
74.	45.	.045
75.	31.	.031
76.	19.	.019
77.	1.	.001
78.	1.	.001
79.	11.	.011
80.	11.	.011
81.	94.	.094
82.	311.	.311
83.	873.	.873
84.	298.	.298

California Coast to Korea/Special/Container

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TIME      DIFFERENCES
                   1      12
1-   84   (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7006	.0925	7.57
2	TRANS	MA	2	12	.8640	.0846	10.21
3	TRANS	AR	1	12	.3236	.1107	2.92

85	10	.42159	.25724
85	11	.13750	.26761
85	12	.16996	.27759
86	1	.18216	.28723
86	2	.12835	.29655
86	3	.30279	.30559
86	4	.16975	.31437
86	5	.13881	.32291
86	6	.20429	.33123
86	7	.24531	.33934
86	8	.52951	.34727
86	9	.37019	.35443

SUM OF 12 FORECASTS = 3.00

The observed value for the Box-Pierce chi square is 13.93 with 20 degrees of freedom, which is not significant at the .05 level.

Northwest Coast to East Alaska/Chill/Container

1.	3.	.003
2.	0.	.000
3.	1.	.001
4.	0.	.000
5.	0.	.000
6.	0.	.000
7.	1.	.001
8.	0.	.000
9.	0.	.000
10.	5.	.005
11.	1.	.001
12.	4.	.004
13.	0.	.000
14.	0.	.000
15.	3.	.003
16.	1.	.001
17.	1.	.001
18.	1.	.001
19.	3.	.003
20.	19.	.019
21.	2.	.002
22.	4.	.004
23.	1.	.001
24.	23.	.023
25.	36.	.036
26.	5.	.005
27.	30.	.030
28.	33.	.033
29.	1.	.001
30.	4.	.004
31.	75.	.025
32.	130.	.130
33.	28.	.028
34.	1.	.001
35.	104.	.104
36.	29.	.029
37.	34.	.034
38.	70.	.070
39.	1.	.001
40.	1.	.001
41.	77.	.077
42.	27.	.027
43.	69.	.069
44.	3.	.003
45.	0.	.000
46.	0.	.000
47.	31.	.031
48.	10.	.010
49.	106.	.106
50.	37.	.037
51.	65.	.065
52.	0.	.000
53.	189.	.189
54.	15.	.015
55.	10.	.010
56.	38.	.038
57.	1.	.001
58.	4.	.004
59.	1.	.001
60.	8.	.008
61.	1.	.001
62.	0.	.000
63.	5.	.005
64.	4.	.004
65.	9.	.009
66.	3.	.003
67.	6.	.006
68.	5.	.005
69.	4.	.004
70.	9.	.009
71.	0.	.000
72.	2.	.002
73.	7.	.007
74.	42.	.042
75.	1.	.001
76.	73.	.073
77.	76.	.076
78.	4.	.004
79.	10.	.010
80.	129.	.129
81.	110.	.110
82.	83.	.083
83.	98.	.098
84.	83.	.083

Northwest Coast to East Alaska/Chill/Container

TIME DIFFERENCES

$$1-\ 84\ (1-B)^{1}$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9183	.1092	8.41
2	TRANS	MA	1	2	-.2130	.1139	-1.87

FORECASTS

85	10	.08952	.03578
85	11	.08952	.03729
85	12	.08952	.03874
86	1	.08952	.04014
86	2	.08952	.04149
86	3	.08952	.04280
86	4	.08952	.04407
86	5	.08952	.04531
86	6	.08952	.04651
86	7	.08952	.04768
86	8	.08952	.04883
86	9	.08952	.04995

SUM OF 12 FORECASTS = 1.07

The observed value for the Box-Pierce chi square is 22.73 with 33 degrees of freedom, which is not significant at the .05 level.

Northwest Coast to East Alaska/Freeze/Container

1.	1.	.001
2.	7.	.007
3.	15.	.015
4.	5.	.005
5.	6.	.006
6.	29.	.029
7.	0.	.000
8.	27.	.027
9.	7.	.007
10.	2.	.002
11.	9.	.009
12.	12.	.012
13.	5.	.005
14.	0.	.000
15.	16.	.016
16.	3.	.003
17.	19.	.019
18.	7.	.007
19.	9.	.009
20.	10.	.010
21.	13.	.013
22.	0.	.000
23.	13.	.013
24.	8.	.008
25.	0.	.000
26.	6.	.006
27.	12.	.012
28.	17.	.017
29.	0.	.000
30.	16.	.016
31.	3.	.003
32.	0.	.000
33.	23.	.023
34.	5.	.005
35.	5.	.005
36.	1.	.001
37.	22.	.022
38.	2.	.002
39.	0.	.000
40.	19.	.019
41.	35.	.035
42.	0.	.000
43.	42.	.042
44.	17.	.017
45.	0.	.000
46.	34.	.034
47.	10.	.010
48.	0.	.000
49.	24.	.024
50.	32.	.033
51.	21.	.021
52.	15.	.015
53.	15.	.015
54.	20.	.020
55.	19.	.019
56.	0.	.000
57.	32.	.032
58.	28.	.028
59.	23.	.023
60.	4.	.004
61.	28.	.028
62.	11.	.011
63.	26.	.026
64.	30.	.030
65.	24.	.024
66.	22.	.022
67.	16.	.016
68.	0.	.000
69.	66.	.066
70.	26.	.026
71.	0.	.000
72.	77.	.077
73.	14.	.014
74.	0.	.000
75.	40.	.040

Northwest Coast to East Alaska/Freeze/Container

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TIME     DIFFERENCES
                1        12
1-  75  (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8168	.0873	9.36
2	TRANS	AR	1	1	-.5495	.1280	-4.29
3	TRANS	AR	1	2	-.5399	.1318	-4.10
4	TRANS	AR	2	12	-.5259	.1482	-3.55

FORECASTS		
85 10	.03310	.01685
85 11	.01253	.01703
85 12	.03896	.01856
86 1	.03139	.01856
86 2	.00264	.01859
86 3	.05898	.01891
86 4	-.03909	.01898
86 5	.01922	.01898
86 6	.04754	.01908
86 7	.03205	.01916
86 8	.01466	.01918
86 9	.05190	.02117

SUM OF 12 FORECASTS = .38

The observed value for the Box-Pierce chi square is 16.64 with 20 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-78.

Northwest Coast to East Alaska/POV/Container

1.	697.	.697
2.	886.	.886
3.	851.	.851
4.	703.	.703
5.	650.	.650
6.	778.	.778
7.	1246.	1.246
8.	761.	.761
9.	750.	.750
10.	926.	.926
11.	899.	.899
12.	844.	.844
13.	976.	.976
14.	636.	.636
15.	1018.	1.018
16.	804.	.804
17.	630.	.630
18.	723.	.723
19.	929.	.929
20.	543.	.543
21.	766.	.766
22.	557.	.557
23.	72.	.072
24.	210.	.210
25.	642.	.642
26.	1489.	1.489
27.	1141.	1.141
28.	712.	.712
29.	627.	.627
30.	987.	.987
31.	883.	.883
32.	794.	.794
33.	764.	.764
34.	850.	.850
35.	819.	.819
36.	956.	.956
37.	1054.	1.054
38.	1438.	1.438
39.	1301.	1.301
40.	1143.	1.143
41.	774.	.774
42.	1137.	1.137
43.	880.	.880
44.	1078.	1.078
45.	1207.	1.207
46.	900.	.900
47.	950.	.950
48.	795.	.795
49.	549.	.549
50.	914.	.914
51.	7[illegible]7.	.717
52.	793.	.783
53.	1339.	1.339
54.	425.	.425
55.	685.	.685
56.	690.	.690
57.	1014.	1.014
58.	484.	.484
59.	737.	.737
60.	1432.	1.432
61.	549.	.549
62.	914.	.914
63.	717.	.717

Northwest Coast to East Alaska/POV/Container

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TIME      DIFFERENCES
                 1       12
1-  63  (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8338	.1036	8.05
2	TRANS	AR	1	1	.2324	.1803	1.29
3	TRANS	AR	2	12	-.4517	.1473	-3.07

FORECASTS

85 10	.84043	.43269
85 11	.98396	.44502
85 12	.64853	.45422
86 1	.67528	.46265
86 2	.76754	.47081
86 3	1.00311	.47879
86 4	.57420	.48664
86 5	.73562	.49436
86 6	1.04673	.50196
86 7	.45154	.50944
86 8	.81571	.51682
86 9	.69291	.60134

SUM OF 12 FORECASTS = 9.24

The observed value for the Box-Pierce chi square is 11.71 with 20 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-79.

Northwest Coast to East Alaska/Ammunition/Container

1.	10.	.010
2.	2.	.002
3.	4.	.004
4.	0.	.000
5.	32.	.032
6.	8.	.008
7.	1.	.001
8.	9.	.009
9.	0.	.000
10.	1.	.001
11.	1.	.001
12.	0.	.000
13.	2.	.002
14.	2.	.002
15.	0.	.000
16.	0.	.000
17.	0.	.000
18.	0.	.000
19.	0.	.000
20.	0.	.000
21.	0.	.000
22.	0.	.000
23.	11.	.011
24.	0.	.000
25.	0.	.000
26.	0.	.000
27.	5.	.005
28.	0.	.000
29.	1.	.001
30.	6.	.006
31.	0.	.000
32.	0.	.000
33.	0.	.000
34.	0.	.000
35.	0.	.000
36.	0.	.000
37.	0.	.000
38.	0.	.000
39.	0.	.000
40.	5.	.005
41.	0.	.000
42.	3.	.003
43.	1.	.001
44.	1.	.001
45.	1.	.001
46.	1.	.001
47.	1.	.001
48.	0.	.000
49.	0.	.000
50.	1.	.001
51.	4.	.004
52.	0.	.000
53.	5.	.005
54.	0.	.000
55.	0.	.000
56.	1.	.001
57.	0.	.000
58.	1.	.001
59.	0.	.000
60.	5.	.005
61.	2.	.002
62.	1.	.001
63.	0.	.000
64.	0.	.000
65.	2.	.002
66.	0.	.000
67.	1.	.001
68.	0.	.000
69.	0.	.000
70.	0.	.000
71.	0.	.000
72.	0.	.000

Northwest Coast to East Alaska/Ammunition/Container

TIME DIFFERENCES
1
1- 72 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8882	.0453	19.62

FORECASTS		
85 10	.00076	.00455
85 11	.00076	.00457
85 12	.00076	.00460
86 1	.00076	.00463
86 2	.00076	.00466
86 3	.00076	.00468
86 4	.00076	.00471
86 5	.00076	.00474
86 6	.00076	.00477
86 7	.00076	.00479
86 8	.00076	.00482
86 9	.00076	.00485

SUM OF 12 FORECASTS = .C1

The observed value for the Box-Pierce chi square is 10.56 with 36 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-78.

Northwest Coast to East Alaska/General/Container

1.	3815.	3.815
2.	5095.	5.095
3.	4903.	4.903
4.	3857.	3.857
5.	3398.	3.398
6.	3154.	3.154
7.	2467.	2.467
8.	3063.	3.063
9.	3903.	3.903
10.	4557.	4.557
11.	4119.	4.119
12.	3409.	3.409
13.	5140.	5.140
14.	4820.	4.820
15.	4455.	4.455
16.	3377.	3.377
17.	2722.	2.722
18.	3134.	3.134
19.	2690.	2.690
20.	3790.	3.790
21.	4617.	4.617
22.	5788.	5.788
23.	3880.	3.880
24.	3319.	3.319
25.	3386.	3.386
26.	3842.	3.842
27.	3488.	3.488
28.	3214.	3.214
29.	2833.	2.833
30.	3229.	3.229
31.	3404.	3.404
32.	3742.	3.742
33.	3513.	3.513
34.	4179.	4.179
35.	4019.	4.019
36.	3687.	3.687
37.	3915.	3.915
38.	5418.	5.418
39.	4742.	4.742
40.	3858.	3.858
41.	6040.	6.040
42.	3897.	3.897
43.	4840.	4.840
44.	3546.	3.546
45.	4293.	4.293
46.	6920.	6.920
47.	6345.	6.345
48.	5762.	5.762
49.	6937.	6.937
50.	5362.	5.382
51.	5082.	5.082
52.	4367.	4.367
53.	4433.	4.433
54.	5285.	5.285
55.	2707.	2.707
56.	5279.	5.279
57.	5115.	5.115
58.	5188.	5.188
59.	6387.	6.387
60.	4800.	4.800
61.	4608.	4.608
62.	6782.	6.782
63.	5273.	5.273
64.	5281.	5.281
65.	4382.	4.382
66.	3511.	3.511
67.	3469.	3.469
68.	3997.	3.997
69.	6137.	6.187
70.	4582.	4.582
71.	5750.	5.750
72.	6364.	6.364
73.	4958.	4.958
74.	5220.	5.220
75.	5773.	5.773

Northwest Coast to East Alaska/General/Container

TIME DIFFERENCES

1- 75 $(1-B^{1})$ $(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.3315	.2095	1.58
2	TRANS	MA	1	4	.3286	.1317	2.49
3	TRANS	MA	2	12	.5931	.2059	2.88
4	TRANS	AR	1	1	-.2482	.2260	-1.10
5	TRANS	AR	2	12	-.1920	.2378	-.81

FORECASTS

85	10	3.69465	1.21611
85	11	4.10799	1.37077
85	12	4.27385	1.49334
86	1	3.46437	1.51157
86	2	4.38449	1.54569
86	3	5.04836	1.57471
86	4	5.48002	1.60424
86	5	5.70962	1.63299
86	6	5.09141	1.66130
86	7	5.02642	1.68912
86	8	5.70785	1.71649
86	9	4.98615	1.80132

SUM OF 12 FORECASTS = 56.98

The observed value for the Box-Pierce chi square is 20.06 with 18 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-78.

Northwest Coast to East Alaska/HHG/Container

1.	367.	.367
2.	317.	.317
3.	168.	.168
4.	181.	.181
5.	97.	.097
6.	68.	.068
7.	70.	.070
8.	159.	.159
9.	75.	.075
10.	35.	.035
11.	116.	.116
12.	122.	.122
13.	202.	.202
14.	267.	.267
15.	245.	.245
16.	66.	.066
17.	92.	.092
18.	122.	.122
19.	72.	.072
20.	101.	.101
21.	107.	.107
22.	73.	.073
23.	99.	.099
24.	38.	.038
25.	68.	.068
26.	170.	.170
27.	139.	.139
28.	131.	.131
29.	11.	.011
30.	54.	.054
31.	91.	.091
32.	59.	.059
33.	63.	.063
34.	80.	.080
35.	63.	.063
36.	136.	.136
37.	144.	.144
38.	97.	.097
39.	225.	.225
40.	39.	.039
41.	110.	.110
42.	92.	.092
43.	93.	.093
44.	174.	.174
45.	45.	.045
46.	118.	.118
47.	45.	.045
48.	142.	.142
49.	146.	.146
50.	66.	.066
51.	55.	.055
52.	164.	.164
53.	137.	.137
54.	431.	.431
55.	198.	.198
56.	393.	.393
57.	576.	.576
58.	472.	.472
59.	449.	.449
60.	164.	.164
61.	514.	.514
62.	414.	.414
63.	366.	.366
64.	216.	.216
65.	153.	.153
66.	152.	.152
67.	94.	.094
68.	158.	.158
69.	181.	.181
70.	136.	.136
71.	235.	.235
72.	224.	.224
73.	220.	.220
74.	196.	.196
75.	196.	.196

Northwest Coast to East Alaska/HHG/Container

TIME DIFFERENCES

1- 75 $(1-B^1)$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	AR	1	1	-.3603	.1130	-3.19
2	TRANS	AR	2	6	-.2465	.1144	-2.16

FORECASTS		
85 10	.20346	.11007
85 11	.17927	.13118
85 12	.18196	.14730
86 1	.18306	.16248
86 2	.18884	.17614
86 3	.18954	.18189
86 4	.18704	.16960
86 5	.19300	.19623
86 6	.19234	.20291
86 7	.19207	.20929
86 8	.19064	.21551
86 9	.19047	.22291

SUM OF 12 FORECASTS = 2.27

The observed value for the Box-Pierce chi square is 22.75 with 33 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-78.

Northwest Coast to East Alaska/Special/Container

1.	113.	.113
2.	326.	.326
3.	117.	.117
4.	458.	.458
5.	343.	.343
6.	476.	.476
7.	562.	.562
8.	195.	.195
9.	357.	.357
10.	392.	.392
11.	360.	.360
12.	328.	.328
13.	327.	.327
14.	346.	.346
15.	366.	.366
16.	202.	.202
17.	418.	.418
18.	187.	.187
19.	646.	.646
20.	192.	.192
21.	566.	.566
22.	581.	.581
23.	241.	.241
24.	245.	.245
25.	202.	.202
26.	252.	.252
27.	196.	.196
28.	198.	.198
29.	5.	.005
30.	238.	.238
31.	328.	.328
32.	647.	.647
33.	226.	.226
34.	16.	.016
35.	8.	.008
36.	44.	.044
37.	10.	.010
38.	25.	.025
39.	208.	.208
40.	294.	.294
41.	787.	.787
42.	45.	.045
43.	150.	.150
44.	0.	.000
45.	27.	.027
46.	51.	.051
47.	364.	.364
48.	0.	.000
49.	39.	.039
50.	489.	.489
51.	109.	.109
52.	446.	.446
53.	375.	.375
54.	26.	.026
55.	569.	.569
56.	359.	.359
57.	659.	.659
58.	318.	.318
59.	141.	.141
60.	188.	.188
61.	192.	.192
62.	501.	.501
63.	205.	.205
64.	255.	.255
65.	190.	.190
66.	164.	.164
67.	26.	.026
68.	30.	.029

Northwest Coast to East Alaska/Special/Container

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                    TIME     DIFFERENCES
                                 1      12
                 1-   68  (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6982	.1067	6.54
2	TRANS	MA	2	12	.7035	.1561	4.51
3	TRANS	AR	1	12	-.2274	.1961	-1.16

FORECASTS		
85 10	.18830	.26817
85 11	.13901	.27914
85 12	.07950	.28969
86 1	-.01181	.29987
86 2	-.02385	.30972
86 3	.14856	.31927
86 4	.04453	.32853
86 5	.13333	.33755
86 6	.23005	.34632
86 7	-.03497	.35488
86 8	.26626	.36324
86 9	.08444	.37551

SUM OF 12 FORECASTS = 1.24

The observed value for the Box-Pierce chi square is 13.11 with 20 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-79.

California Coast to Ryukyu Islands/Chill/Container

1.	6.	.006
2.	65.	.065
3.	122.	.122
4.	178.	.178
5.	91.	.091
6.	147.	.147
7.	239.	.239
8.	81.	.081
9.	89.	.089
10.	86.	.086
11.	51.	.051
12.	224.	.224
13.	316.	.316
14.	69.	.069
15.	134.	.134
16.	0.	.000
17.	260.	.260
18.	151.	.151
19.	32.	.032
20.	122.	.122
21.	71.	.071
22.	114.	.114
23.	125.	.125
24.	85.	.085
25.	50.	.050
26.	85.	.085
27.	100.	.099
28.	90.	.089
29.	144.	.144
30.	48.	.048
31.	98.	.096
32.	107.	.107
33.	58.	.058
34.	62.	.062
35.	73.	.073
36.	88.	.088
37.	92.	.092
38.	57.	.057
39.	68.	.068
40.	120.	.120
41.	79.	.079
42.	80.	.080
43.	98.	.098
44.	89.	.089
45.	89.	.089
46.	97.	.097
47.	95.	.095
48.	54.	.054
49.	153.	.153
50.	63.	.063
51.	94.	.094
52.	91.	.090
53.	124.	.124
54.	89.	.089
55.	133.	.133
56.	90.	.090
57.	32.	.032
58.	72.	.072
59.	63.	.063
60.	84.	.083
61.	65.	.065
62.	58.	.058
63.	213.	.213
64.	66.	.066
65.	66.	.066
66.	167.	.167
67.	65.	.065
68.	32.	.032
69.	145.	.145
70.	122.	.122
71.	87.	.087
72.	110.	.110
73.	59.	.059
74.	67.	.067
75.	62.	.062
76.	69.	.069
77.	87.	.087
78.	90.	.090
79.	148.	.148
80.	59.	.059
81.	99.	.099
82.	147.	.147
83.	76.	.076
84.	122.	.122

California Coast to Ryukyu Islands/Chill/Container

TIME DIFFERENCES

1

1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9643	.0267	36.15
2	TRANS	MA	2	12	.2807	.1027	2.73

FORECASTS

85 10	.09667	.07300
85 11	.09719	.07305
85 12	.08549	.07309
86 1	.09479	.07314
86 2	.08913	.07318
86 3	.08131	.07323
86 4	.07210	.07328
86 5	.10066	.07332
86 6	.08182	.07337
86 7	.06917	.07342
86 8	.09203	.07346
86 9	.08807	.07561

SUM OF 12 FORECASTS = 1.05

The observed value for the Box-Pierce chi square is 11.87 with 33 degrees of freedom, which is not significant at the .05 level.

California Coast to Ryukyu Islands/Freeze/Container

1.	33.	.033
2.	118.	.118
3.	205.	.205
4.	156.	.156
5.	77.	.077
6.	167.	.167
7.	292.	.292
8.	208.	.208
9.	199.	.199
10.	133.	.133
11.	121.	.121
12.	308.	.308
13.	131.	.131
14.	103.	.103
15.	257.	.257
16.	91.	.090
17.	215.	.215
18.	150.	.150
19.	155.	.155
20.	251.	.251
21.	120.	.120
22.	145.	.145
23.	125.	.125
24.	26.	.026
25.	60.	.061
26.	117.	.117
27.	149.	.149
28.	109.	.109
29.	199.	.199
30.	116.	.116
31.	130.	.130
32.	108.	.108
33.	128.	.128
34.	112.	.112
35.	111.	.111
36.	219.	.219
37.	142.	.142
38.	179.	.179
39.	87.	.087
40.	157.	.157
41.	197.	.197
42.	172.	.172
43.	235.	.235
44.	103.	.103
45.	143.	.143
46.	177.	.177
47.	156.	.156
48.	149.	.149
49.	221.	.221
50.	131.	.131
51.	192.	.192
52.	128.	.128
53.	166.	.166
54.	122.	.122
55.	193.	.193
56.	153.	.153
57.	146.	.146
58.	124.	.124
59.	164.	.164
60.	175.	.175
61.	104.	.104
62.	73.	.073
63.	257.	.257
64.	294.	.294
65.	144.	.144
66.	189.	.189
67.	177.	.177
68.	141.	.141
69.	286.	.286
70.	129.	.129
71.	186.	.186
72.	116.	.116
73.	171.	.171
74.	99.	.099
75.	54.	.054
76.	135.	.135
77.	133.	.133
78.	291.	.291
79.	288.	.288
80.	203.	.203
81.	183.	.183
82.	253.	.253
83.	138.	.138
84.	236.	.236

California Coast to Ryukyu Islands/Freeze/Container

TIME DIFFERENCES
1
1- 84 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9674	.0161	59.97

FORECASTS		
85 10	.15054	.08287
85 11	.15054	.06287
85 12	.15054	.06291
86 1	.15054	.06296
86 2	.15054	.06300
86 3	.15054	.06304
86 4	.15054	.06309
86 5	.15054	.06313
86 6	.15054	.06318
86 7	.15054	.06322
86 8	.15054	.06326
86 9	.15054	.06331

SUM OF 12 FORECASTS = 1.81

The observed value for the Box-Pierce chi square is 13.00 with 20 degrees of freedom, which is not significant at the .05 level.

California Coast to Ryukyu Islands/POV/Container

1.	37.	.037
2.	0.	.000
3.	39.	.039
4.	14.	.014
5.	0.	.000
6.	8.	.008
7.	0.	.000
8.	10.	.010
9.	30.	.030
10.	0.	.000
11.	26.	.026
12.	0.	.000
13.	0.	.000
14.	22.	.022
15.	0.	.000
16.	17.	.017
17.	0.	.000
18.	9.	.009
19.	0.	.000
20.	0.	.000
21.	23.	.023
22.	31.	.031
23.	21.	.021
24.	0.	.000
25.	14.	.014
26.	45.	.045
27.	14.	.014
28.	27.	.027
29.	22.	.022
30.	0.	.000
31.	13.	.013
32.	0.	.000
33.	35.	.035
34.	5.	.005
35.	8.	.008
36.	0.	.000
37.	18.	.018
38.	0.	.000
39.	0.	.000
40.	0.	.000
41.	13.	.013
42.	0.	.000
43.	2.	.002
44.	8.	.008
45.	0.	.000
46.	41.	.041
47.	2.	.002
48.	0.	.000
49.	0.	.000
50.	0.	.000
51.	23.	.023
52.	0.	.000
53.	0.	.000
54.	10.	.010
55.	0.	.000
56.	3.	.003
57.	18.	.018
58.	14.	.014
59.	0.	.000
60.	0.	.000

California Coast to Ryukyu Islands/POV/Container

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              TIME      DIFFERENCES
                           1       12
            1-   60  (1-8   ) (1-6   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7228	.0900	8.03
2	TRANS	MA	1	6	.2932	.1068	2.74
3	TRANS	MA	2	12	.8350	.0614	13.60
4	TRANS	AR	1	1	-.5521	.1149	-4.81

FORECASTS		
85 10	-.00467	.01610
85 11	.01986	.01742
85 12	.01903	.01743
86 1	.01723	.01787
86 2	.00977	.01800
86 3	.01204	.01306
86 4	.00713	.01806
86 5	.01196	.01807
86 6	.02920	.01807
86 7	.01700	.01807
86 8	.02114	.01807
86 9	.00640	.01623

SUM OF 12 FORECASTS = .17

The observed value for the Box-Pierce chi square is 25.11 with 19 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-79 and has 7-84 and 8-84 set to zero.

California Coast to Ryukyu Islands/General/Container

1.	3238.	3.238
2.	3628.	3.628
3.	3767.	3.767
4.	3578.	3.578
5.	3689.	3.689
6.	3769.	3.769
7.	5196.	5.196
8.	4616.	4.616
9.	6178.	6.178
10.	5329.	5.329
11.	3994.	3.994
12.	3760.	3.760
13.	3930.	3.930
14.	3092.	3.092
15.	3375.	3.375
16.	3105.	3.105
17.	3366.	3.366
18.	4192.	4.192
19.	2816.	2.816
20.	5305.	5.305
21.	4653.	4.653
22.	6355.	6.355
23.	4213.	4.213
24.	5064.	5.064
25.	3316.	3.316
26.	3491.	3.491
27.	4500.	4.500
28.	3246.	3.246
29.	2871.	2.871
30.	4423.	4.423
31.	5334.	5.334
32.	4945.	4.945
33.	5031.	5.031
34.	4819.	4.819
35.	3691.	3.691
36.	2733.	2.733
37.	2827.	2.827
38.	3159.	3.159
39.	3038.	3.038
40.	4023.	4.023
41.	3725.	3.725
42.	4970.	4.970
43.	6319.	6.319
44.	4176.	4.176
45.	4044.	4.044
46.	3805.	3.805
47.	2866.	2.866
48.	4648.	4.648
49.	4084.	4.084
50.	4387.	4.387
51.	4363.	4.363
52.	4035.	4.035
53.	4957.	4.957
54.	6048.	6.048
55.	7368.	7.368
56.	3430.	3.430
57.	5237.	5.237
58.	3793.	3.793
59.	4690.	4.690
60.	3856.	3.856
61.	4464.	4.464
62.	3623.	3.623
63.	4234.	4.234
64.	3085.	3.085
65.	3575.	3.575
66.	4968.	4.968
67.	5464.	5.464
68.	4522.	4.522
69.	5757.	5.757
70.	4488.	4.488
71.	4150.	4.150
72.	4294.	4.294
73.	4856.	4.856
74.	5487.	5.487
75.	4454.	4.454
76.	2631.	2.631
77.	3908.	3.908
78.	5312.	5.312
79.	4226.	4.226
80.	5375.	5.375
81.	5316.	5.316
82.	6327.	6.327
83.	5851.	5.851
84.	5079.	5.079

California Coast to Ryukyu Islands/General/Container

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TIME      DIFFERENCES
                    1        12
1-   84   (1-B  )  (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8092	.0687	11.78
2	TRANS	MA	2	12	.9239	.1231	7.51
3	TRANS	AR	1	12	.3244	.1884	1.72

FORECASTS		
85 10	4.49312	1.50917
85 11	4.10553	1.53545
85 12	3.90551	1.56128
86 1	2.96627	1.58669
86 2	3.66103	1.61171
86 3	4.96079	1.63634
86 4	3.47630	1.66060
86 5	5.38746	1.68452
86 6	4.85685	1.70810
86 7	6.29578	1.73136
86 8	4.93830	1.75432
86 9	5.42891	1.96111

SUM OF 12 FORECASTS = 54.46

The observed value for the Box-Pierce chi square is 25.20 with 20 degrees of freedom, which is not significant at the .05 level.

California Coast to Ryukyu Islands/General/Breakbulk

1.	0.	.000
2.	1.	.001
3.	8.	.008
4.	0.	.000
5.	16.	.016
6.	2.	.002
7.	8.	.008
8.	219.	.219
9.	1.	.001
10.	6.	.006
11.	25.	.025
12.	295.	.295
13.	270.	.270
14.	14.	.014
15.	139.	.139
16.	18.	.018
17.	23.	.023
18.	0.	.000
19.	9.	.009
20.	1.	.001
21.	0.	.000
22.	3.	.003
23.	3.	.003
24.	59.	.059
25.	61.	.061
26.	63.	.063
27.	2.	.002
28.	0.	.000
29.	0.	.000
30.	27.	.027
31.	0.	.000
32.	11.	.011
33.	3.	.003
34.	88.	.086
35.	0.	.000
36.	2.	.002
37.	50.	.050
38.	33.	.033
39.	12.	.012
40.	299.	.299
41.	0.	.000
42.	3.	.003
43.	12.	.012
44.	1.	.001
45.	1.	.001
46.	0.	.000
47.	8.	.008
48.	11.	.011
49.	14.	.014
50.	72.	.071
51.	18.	.018
52.	0.	.000
53.	6.	.006
54.	12.	.012
55.	1.	.001
56.	1.	.001
57.	6.	.006
58.	7.	.007
59.	0.	.000
60.	0.	.000
61.	3.	.003
62.	0.	.000
63.	2.	.002
64.	1.	.001
65.	4.	.004
66.	2.	.002
67.	30.	.030
68.	13.	.013
69.	17.	.017
70.	0.	.000
71.	29.	.029
72.	13.	.014
73.	17.	.017
74.	143.	.143
75.	3.	.003
76.	119.	.119
77.	115.	.115
78.	59.	.058
79.	10.	.010
80.	0.	.000
81.	271.	.271
82.	0.	.000
83.	64.	.064
84.	18.	.018

California Coast to Ryukyu Islands/General/Breakbulk

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TIME     DIFFERENCES
                1      12
1-  84  (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8358	.0620	13.47
2	TRANS	MA	2	12	.9378	.0362	25.92
3	TRANS	AR	1	1	-.3043-001	.1171	-.26
4	TRANS	AR	2	12	-.1176	.0884	-1.33

FORECASTS		
85 10	.12868	.08031
85 11	.10230	.06131
85 12	.18964	.08230
86 1	.10947	.06327
86 2	.09744	.06423
86 3	.08467	.06518
86 4	.09454	.06612
86 5	.10591	.06705
86 6	.07206	.06797
86 7	.09293	.06888
86 8	.08828	.06978
86 9	.14824	.09016

SUM OF 12 FORECASTS = 1.31

The observed value for the Box-Pierce chi square is 11.42 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Ryukyu Islands/HHG/Container

1.	39.	.039
2.	2.	.002
3.	15.	.015
4.	52.	.052
5.	20.	.020
6.	65.	.065
7.	91.	.091
8.	60.	.060
9.	52.	.052
10.	26.	.026
11.	80.	.080
12.	7.	.007
13.	14.	.014
14.	34.	.035
15.	18.	.018
16.	5.	.005
17.	21.	.022
18.	135.	.135
19.	40.	.040
20.	61.	.061
21.	11.	.011
22.	21.	.021
23.	83.	.083
24.	11.	.011
25.	7.	.007
26.	39.	.039
27.	32.	.032
28.	31.	.031
29.	25.	.025
30.	78.	.078
31.	171.	.171
32.	28.	.028
33.	65.	.065
34.	165.	.165
35.	85.	.084
36.	52.	.052
37.	52.	.052
38.	88.	.088
39.	57.	.057
40.	99.	.099
41.	137.	.137
42.	75.	.075
43.	100.	.100
44.	120.	.120
45.	35.	.035
46.	106.	.106
47.	0.	.000
48.	43.	.043
49.	112.	.112
50.	51.	.052
51.	84.	.083
52.	28.	.028
53.	30.	.030
54.	39.	.039
55.	60.	.060
56.	10.	.010
57.	27.	.027
58.	36.	.036
59.	11.	.011
60.	25.	.025
61.	5.	.005
62.	18.	.016
63.	34.	.034
64.	27.	.027
65.	12.	.012
66.	39.	.039
67.	60.	.060
68.	13.	.013
69.	33.	.033

California Coast to Ryukyu Islands/HHG/Container

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TIME      DIFFERENCES
                  1       12
1-  69  (1-B  ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.5147	.1820	2.83
2	TRANS	MA	2	12	.9318	.0480	19.39
3	TRANS	AR	1	1	-.4418	.1915	-2.31
4	TRANS	AR	1	2	-.3058	.1657	-1.85

FORECASTS

85 10	.01023	.04309
85 11	.03674	.04364
85 12	-.01646	.04694
86 1	-.00932	.04824
86 2	.00648	.04941
86 3	-.00433	.05103
86 4	.01609	.05242
86 5	.00273	.05371
86 6	.03950	.05505
86 7	.00146	.05634
86 8	.02890	.05759
86 9	.01911	.05948

SUM OF 12 FORECASTS = .19

The observed value for the Box-Pierce chi square is 14.82 with 19 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 01-79.

California Coast to Ryukyu Islands/Special/Breakbulk

1.	5.	.005
2.	0.	.000
3.	84.	.084
4.	0.	.000
5.	0.	.000
6.	55.	.055
7.	133.	.133
8.	0.	.000
9.	0.	.000
10.	0.	.000
11.	0.	.000
12.	47.	.047
13.	35.	.035
14.	0.	.000
15.	33.	.033
16.	47.	.047
17.	0.	.000
18.	0.	.000
19.	0.	.000
20.	0.	.000
21.	0.	.000
22.	66.	.066
23.	9.	.009
24.	0.	.000
25.	0.	.000
26.	53.	.053
27.	0.	.000
28.	0.	.000
29.	0.	.000
30.	0.	.000
31.	0.	.000
32.	0.	.000
33.	78.	.078
34.	24.	.024
35.	225.	.225
36.	0.	.000
37.	0.	.000
38.	0.	.000
39.	36.	.036
40.	0.	.000
41.	0.	.000
42.	0.	.000
43.	0.	.000
44.	0.	.000
45.	0.	.000
46.	117.	.117
47.	216.	.216
48.	7.	.007
49.	19.	.019
50.	0.	.000
51.	90.	.090
52.	0.	.000
53.	0.	.000
54.	37.	.037
55.	0.	.000
56.	0.	.000
57.	0.	.000
58.	0.	.000
59.	170.	.170
60.	0.	.000

California Coast to Ryukyu Islands/Special/Breakbulk

TIME DIFFERENCES

$$1- \ 6_0 \ (1-B^{1}) \ (1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9725	.0300	32.44
2	TRANS	MA	2	12	.6575	.0940	6.99

FORECASTS		
85 10	.04707	.06770
85 11	.04407	.06773
85 12	.09428	.06775
86 1	.04075	.06778
86 2	.03620	.06780
86 3	.05922	.06783
86 4	.06096	.06785
86 5	.03620	.06788
86 6	.04774	.06791
86 7	.07253	.06793
86 8	.17735	.06796
86 9	.06222	.07242

SUM OF 12 FORECASTS = .78

The observed value for the Box-Pierce chi square is 17.26 with 20 degrees of freedom, which is not significant at the .05 level. The data series on which the model is based begins on 07-79 and has 10.79 and 8-84 set to zero.

Hawaii to Hawaii/POV/Breakbulk

1.	142.	.142
2.	46.	.046
3.	26.	.026
4.	69.	.069
5.	96.	.096
6.	78.	.078
7.	55.	.055
8.	21.	.021
9.	61.	.061
10.	55.	.055
11.	64.	.064
12.	61.	.061
13.	30.	.030
14.	60.	.060
15.	36.	.036
16.	66.	.066
17.	25.	.025
18.	55.	.055
19.	50.	.050
20.	27.	.027
21.	100.	.100
22.	37.	.037
23.	58.	.058
24.	34.	.034
25.	74.	.075
26.	47.	.047
27.	53.	.053
28.	81.	.081
29.	16.	.016
30.	98.	.098
31.	53.	.053
32.	51.	.051
33.	51.	.051
34.	151.	.151
35.	160.	.160
36.	93.	.093
37.	91.	.091
38.	41.	.041
39.	53.	.053
40.	50.	.050
41.	40.	.040
42.	14.	.014
43.	24.	.024
44.	22.	.022
45.	25.	.025
46.	65.	.065
47.	48.	.048
48.	36.	.036
49.	68.	.068
50.	26.	.026
51.	25.	.025
52.	65.	.065
53.	47.	.047
54.	7.	.007
55.	31.	.031
56.	45.	.045
57.	109.	.109
58.	59.	.059
59.	44.	.044
60.	88.	.088
61.	88.	.088
62.	68.	.088
63.	41.	.041
64.	70.	.070
65.	47.	.047
66.	25.	.025
67.	22.	.022
68.	18.	.018
69.	30.	.030
70.	45.	.045
71.	74.	.074
72.	63.	.063
73.	42.	.042
74.	54.	.054
75.	53.	.053
76.	15.	.015
77.	53.	.053
78.	74.	.074
79.	131.	.131
80.	26.	.026
81.	62.	.062
82.	27.	.027
83.	56.	.056
84.	46.	.046

Hawaii to Hawaii/POV/Breakbulk

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TIME        DIFFERENCES
                   1       12
1-  84   (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6549	.0831	7.88
2	TRANS	MA	2	12	.8368	.0424	19.75
3	TRANS	AR	1	3	-.2396	.1097	-2.18

FORECASTS		
85 10	.05866	.03701
85 11	.05584	.03893
85 12	.03866	.03910
86 1	.05303	.04017
86 2	.04539	.04120
86 3	.04191	.04269
86 4	.04430	.04382
86 5	.01673	.04492
86 6	.05034	.04589
86 7	.04600	.04691
86 8	.05601	.04790
86 9	.05119	.05036

SUM OF 12 FORECASTS = .56

The observed value for the Box-Pierce chi square is 22.26 with 20 degrees of freedom, which is not significant at the .05 level. For the months 09-82, 10-82, and 11-82, the tonnage values were reevaluated from 113.46, 10.88, and 125.99 to 88.44, 88.44, and 88.44, respectively. 88.44 is the average value for these 3 months.

Hawaii to Hawaii/Ammunition/Breakbulk

1.	1.	.001
2.	33.	.033
3.	7.	.007
4.	33.	.033
5.	69.	.069
6.	73.	.073
7.	60.	.060
8.	36.	.036
9.	2.	.002
10.	51.	.051
11.	8.	.008
12.	38.	.038
13.	79.	.079
14.	61.	.061
15.	5.	.005
16.	25.	.025
17.	7.	.007
18.	67.	.067
19.	95.	.095
20.	24.	.024
21.	2.	.002
22.	41.	.041
23.	2.	.002
24.	0.	.000
25.	10.	.010
26.	0.	.000
27.	1.	.001
28.	1.	.001
29.	4.	.004
30.	1.	.001
31.	5.	.005
32.	10.	.010
33.	2.	.002
34.	1.	.001
35.	0.	.000
36.	37.	.037
37.	4.	.004
38.	0.	.000
39.	0.	.000
40.	0.	.000
41.	1.	.001
42.	0.	.000
43.	12.	.012
44.	11.	.011
45.	9.	.009
46.	6.	.006
47.	46.	.046
48.	6.	.006
49.	28.	.028
50.	0.	.000
51.	14.	.014
52.	5.	.005
53.	6.	.006
54.	5.	.005
55.	22.	.022
56.	34.	.034
57.	24.	.024
58.	99.	.099
59.	32.	.032
60.	16.	.016
61.	49.	.049
62.	7.	.007
63.	1.	.001
64.	9.	.009
65.	18.	.018
66.	0.	.000
67.	3.	.003
68.	7.	.007
69.	7.	.007
70.	161.	.161
71.	1.	.001
72.	5.	.005
73.	38.	.038
74.	128.	.128
75.	1.	.001
76.	0.	.000
77.	137.	.137
78.	0.	.000
79.	0.	.000
80.	6.	.006
81.	6.	.006
82.	163.	.163
83.	0.	.000
84.	127.	.127

Hawaii to Hawaii/Ammunition/Breakbulk

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TIME      DIFFERENCES
                 1        12
1-   84  (1-B   ) (1-B   )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8346	.0742	11.25
2	TRANS	MA	2	12	.4201	.1335	3.15
3	TRANS	AR	1	1	-.1040	.1352	-.77
4	TRANS	AR	1	6	-.2198	.1244	-1.77

FORECASTS		
85 10	.06008	.03952
85 11	.09833	.04002
85 12	.02289	.04045
86 1	.01296	.04088
86 2	.10830	.04130
86 3	.01549	.04139
86 4	.02028	.04187
86 5	.02533	.04211
86 6	.02380	.04238
86 7	.16312	.04264
86 8	.02043	.04290
86 9	.04037	.05208

SUM OF 12 FORECASTS = .61

The observed value for the Box-Pierce chi square is 9.95 with 19 degrees of freedom, which is not significant at the .05 level.

Hawaii to Hawaii/General/Breakbulk

1.	309.	.309
2.	388.	.388
3.	131.	.131
4.	702.	.702
5.	292.	.292
6.	591.	.591
7.	609.	.609
8.	313.	.313
9.	296.	.296
10.	535.	.535
11.	650.	.650
12.	268.	.268
13.	404.	.404
14.	496.	.496
15.	140.	.140
16.	211.	.211
17.	220.	.220
18.	374.	.374
19.	310.	.310
20.	299.	.299
21.	209.	.209
22.	650.	.650
23.	635.	.635
24.	377.	.377
25.	375.	.375
26.	239.	.239
27.	197.	.197
28.	175.	.175
29.	279.	.279
30.	374.	.374
31.	344.	.344
32.	778.	.778
33.	691.	.691
34.	625.	.625
35.	602.	.602
36.	624.	.624
37.	511.	.511
38.	382.	.382
39.	115.	.115
40.	85.	.085
41.	192.	.192
42.	233.	.233
43.	246.	.246
44.	614.	.614
45.	587.	.587
46.	423.	.423
47.	761.	.761
48.	766.	.766
49.	275.	.275
50.	173.	.173
51.	191.	.191
52.	526.	.526
53.	230.	.230
54.	323.	.323
55.	187.	.187
56.	547.	.547
57.	729.	.729
58.	685.	.685
59.	350.	.350
60.	376.	.376
61.	320.	.320
62.	490.	.490
63.	269.	.269
64.	269.	.269
65.	269.	.269
66.	230.	.230
67.	273.	.273
68.	684.	.684
69.	230.	.230
70.	614.	.614
71.	716.	.716
72.	635.	.635
73.	402.	.402
74.	481.	.481
75.	538.	.538
76.	144.	.144
77.	523.	.523
78.	287.	.287
79.	182.	.182
80.	760.	.760
81.	815.	.815
82.	632.	.632
83.	930.	.930
84.	470.	.470

Hawaii to Hawaii/General/Breakbulk

TIME	DIFFERENCES	
	1	12
1- 84	(1-B)	(1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9000	.0441	20.43
2	TRANS	MA	2	12	.7286	.0788	9.25
3	TRANS	AR	1	12	-.2081	.1231	-1.69

FORECASTS		
85 10	.47237	.20309
85 11	.49463	.20409
85 12	.31547	.20509
86 1	.38640	.20608
86 2	.36484	.20707
86 3	.41895	.20805
86 4	.38329	.20903
86 5	.66811	.21001
86 6	.55749	.21098
86 7	.71412	.21194
86 8	.74216	.21290
86 9	.63483	.21545

SUM OF 12 FORECASTS = 6.15

The observed value for the Box-Pierce chi square is 19.30 with 20 degrees of freedom, which is not significant at the .05 level. For 08-80, the tonnage value was adjusted from 1002.31 to 602.31. For the months of 12-82, 01-83, and 02-83 the values of 291.91, 88.41, and 426.64 were replaced with the average of the three values, 268.99.

Hawaii to Hawaii/HHG/Breakbulk

1.	12.	.012
2.	3.	.003
3.	3.	.003
4.	11.	.011
5.	10.	.010
6.	3.	.003
7.	11.	.011
8.	0.	.000
9.	7.	.007
10.	2.	.002
11.	0.	.000
12.	2.	.002
13.	1.	.001
14.	7.	.007
15.	0.	.000
16.	2.	.002
17.	0.	.000
18.	46.	.046
19.	0.	.000
20.	0.	.000
21.	4.	.004
22.	1.	.001
23.	9.	.009
24.	5.	.005
25.	5.	.005
26.	0.	.000
27.	7.	.007
28.	12.	.012
29.	0.	.000
30.	8.	.008
31.	3.	.003
32.	5.	.005
33.	9.	.009
34.	4.	.004
35.	2.	.002
36.	0.	.000
37.	11.	.011
38.	1.	.001
39.	3.	.003
40.	13.	.013
41.	11.	.011
42.	20.	.020

Hawaii to Hawaii/HHG/Breakbulk

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                    TIME      DIFFERENCES
                                   1
                    1-   42  (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9475	.0246	38.52

FORECASTS

85 10	.00642	.00852
85 11	.00642	.00854
85 12	.00642	.00855
86 1	.00642	.00856
86 2	.00642	.00857
86 3	.00642	.00858
86 4	.00642	.00859
86 5	.00642	.00861
86 6	.00642	.00862
86 7	.00642	.00863
86 8	.00642	.00864
86 9	.00642	.00865

SUM OF 12 FORECASTS = .08

The data series used to generate this model was begun with 04-81 due to irregularities in the reported data prior to that time. As a result, it was not possible to fit a seasonal model to this series, even though seasonality is a characteristic of HHG. The observed value of the Box-Pierce chi square is 10.72 with 23 degrees of freedom, which is not significant at the .05 level.

Hawaii to Hawaii/Special/Breakbulk

1.	4582.	4.582
2.	2512.	2.512
3.	2003.	2.003
4.	418.	.418
5.	3692.	3.692
6.	2810.	2.810
7.	3327.	3.327
8.	2405.	2.405
9.	354.	.354
10.	15771.	15.771
11.	9340.	9.340
12.	158.	.158
13.	634.	.634
14.	65.	.065
15.	72.	.072
16.	179.	.179
17.	1801.	1.801
18.	893.	.893
19.	1052.	1.052
20.	5904.	5.904
21.	742.	.742
22.	11504.	11.504
23.	8915.	8.915
24.	307.	.307
25.	348.	.348
26.	179.	.179
27.	116.	.116
28.	43.	.043
29.	151.	.151
30.	92.	.092
31.	141.	.141
32.	540.	.540
33.	58.	.058
34.	8716.	8.716
35.	13805.	13.805
36.	66.	.066
37.	118.	.118
38.	294.	.294
39.	84.	.084
40.	164.	.164
41.	8.	.008
42.	43.	.043
43.	4433.	4.433
44.	9957.	9.957
45.	8437.	8.437
46.	9662.	9.662
47.	11351.	11.351
48.	2938.	2.938
49.	8470.	8.470
50.	162.	.162
51.	350.	.350
52.	536.	.536
53.	1955.	1.955
54.	112.	.112
55.	2512.	2.512
56.	343.	.343
57.	77.	.077
58.	10793.	10.793
59.	17318.	17.318
60.	15942.	15.942
61.	3021.	3.021
62.	4415.	4.415
63.	40.	.040
64.	235.	.235
65.	351.	.351
66.	279.	.279
67.	7890.	7.890
68.	7228.	7.228
69.	337.	.337
70.	8724.	8.724
71.	7140.	7.140
72.	359.	.359
73.	328.	.328
74.	148.	.148
75.	190.	.190
76.	723.	.723
77.	1584.	1.584
78.	329.	.329
79.	604.	.604
80.	266.	.266
81.	1693.	1.693
82.	640.	.640
83.	9141.	9.141
84.	784.	.784

Hawaii to Hawaii/Special/Breakbulk

TIME	DIFFERENCES
1- 84	$(1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7724	.1180	6.55
2	TRANS	MA	2	12	.4215	.1955	2.16
3	TRANS	AR	1	1	.1702	.1852	.92
4	TRANS	AR	2	12	-.3282	.1951	-1.68

FORECASTS

85 10	-.41979	4.01426
85 11	-1.36911	4.16266
85 12	-3.23821	4.28977
86 1	-2.98676	4.41062
86 2	-2.42443	4.52782
86 3	-3.12728	4.64200
86 4	1.02631	4.75342
86 5	.78668	4.86228
86 6	-2.13510	4.96876
86 7	3.84827	5.07301
86 8	6.69912	5.17516
86 9	.94711	5.53275

SUM OF 12 FORECASTS = -2.39

The observed value for the Box-Pierce chi square is 17.07 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/Chill/Breakbulk

1.	20.	.020
2.	11.	.011
3.	30.	.030
4.	33.	.033
5.	18.	.018
6.	6.	.006
7.	7.	.007
8.	6.	.006
9.	26.	.026
10.	18.	.018
11.	13.	.013
12.	31.	.031
13.	9.	.009
14.	25.	.025
15.	10.	.010
16.	43.	.043
17.	20.	.020
18.	6.	.006
19.	9.	.009
20.	5.	.005
21.	1.	.001
22.	12.	.012
23.	4.	.004
24.	28.	.028
25.	4.	.004
26.	29.	.029
27.	17.	.017
28.	21.	.021
29.	21.	.021
30.	4.	.004
31.	6.	.006
32.	3.	.003
33.	11.	.011
34.	5.	.005
35.	24.	.024
36.	20.	.020
37.	14.	.014
38.	21.	.021
39.	19.	.019
40.	43.	.043
41.	5.	.005
42.	4.	.004
43.	5.	.005
44.	13.	.013
45.	7.	.007
46.	25.	.025
47.	52.	.052
48.	23.	.023
49.	13.	.013
50.	30.	.030
51.	18.	.016
52.	30.	.030
53.	5.	.005
54.	7.	.007
55.	7.	.007
56.	10.	.010
57.	8.	.008
58.	9.	.009
59.	31.	.031
60.	9.	.009
61.	19.	.019
62.	15.	.015
63.	54.	.053
64.	50.	.050
65.	9.	.009
66.	6.	.006
67.	4.	.004
68.	7.	.007
69.	6.	.006
70.	45.	.045
71.	22.	.022
72.	48.	.047
73.	35.	.035
74.	15.	.015
75.	30.	.030
76.	45.	.046
77.	4.	.004
78.	8.	.008
79.	1.	.001
80.	4.	.004
81.	9.	.009
82.	13.	.014
83.	11.	.011
84.	45.	.045

California Coast to Hawaii/Chill/Breakbulk

TIME DIFFERENCES

$1- 84 \quad (1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9016	.0552	16.34
2	TRANS	MA	2	12	-.2552	.1746	-1.46
3	TRANS	AR	1	1	-.1258	.1315	-.96
4	TRANS	AR	2	12	-.7828	.1310	-5.97

FORECASTS

85 10	.02679	.01374
85 11	.01185	.01381
85 12	.04658	.01386
86 1	.05050	.01391
86 2	.00634	.01396
86 3	.00588	.01401
86 4	.00094	.01406
86 5	.00460	.01411
86 6	.00619	.01417
86 7	.03492	.01422
86 8	.01558	.01427
86 9	.04222	.01621

SUM OF 12 FORECASTS = .25

The observed value for the Box-Pierce chi square is 21.51 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/Freeze/Breakbulk

1.	24.	.025
2.	30.	.030
3.	26.	.026
4.	40.	.040
5.	15.	.015
6.	34.	.034
7.	18.	.018
8.	37.	.037
9.	52.	.052
10.	57.	.057
11.	19.	.019
12.	46.	.046
13.	41.	.041
14.	31.	.031
15.	26.	.026
16.	32.	.032
17.	39.	.039
13.	49.	.049
19.	83.	.083
20.	22.	.022
21.	43.	.043
22.	88.	.088
23.	53.	.053
24.	32.	.032
25.	27.	.027
26.	33.	.033
27.	22.	.022
28.	19.	.019
29.	33.	.033
30.	47.	.047
31.	51.	.051
32.	54.	.054
33.	58.	.058
34.	96.	.096
35.	60.	.061
36.	40.	.040
37.	82.	.082
38.	26.	.026
39.	27.	.027
40.	90.	.090
41.	23.	.023
42.	34.	.034
43.	66.	.066
44.	81.	.081
45.	73.	.073
46.	71.	.071
47.	70.	.070
48.	66.	.066
49.	89.	.089
50.	43.	.043
51.	65.	.065
52.	64.	.064
53.	51.	.051
54.	65.	.065
55.	76.	.076
56.	78.	.078
57.	83.	.083
58.	91.	.091
59.	62.	.062
60.	44.	.044
61.	71.	.071
62.	66.	.066
63.	111.	.111
64.	56.	.056
65.	83.	.083
66.	105.	.105
67.	75.	.075
68.	77.	.077
69.	79.	.079
70.	121.	.121
71.	76.	.076
72.	89.	.089
73.	101.	.101
74.	52.	.052
75.	50.	.050
76.	26.	.026
77.	97.	.097
78.	88.	.088
79.	61.	.061
80.	67.	.067
81.	120.	.120
82.	68.	.068
83.	121.	.121
84.	99.	.099

California Coast to Hawaii/Freeze/Breakbulk

TIME DIFFERENCES

1- 84 $(1-B^{1})(1-B^{12})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8334	.0773	10.78
2	TRANS	MA	2	12	.7499	.0623	12.04
3	TRANS	AR	1	1	-.2123	.1307	- .62
4	TRANS	AR	1	2	-.2468	.1319	-1.87

FORECASTS

85 10	.08386	.02336
85 11	.06899	.02341
85 12	.07819	.02384
86 1	.06866	.02407
86 2	.08012	.02416
86 3	.09079	.02430
86 4	.08250	.02447
86 5	.08615	.02461
86 6	.10399	.02475
86 7	.10627	.02489
86 8	.09510	.02504
86 9	.08682	.02644

SUM OF 12 FORECASTS = 1.03

The observed value for the Box-Pierce chi square is 21.62 with 19 degrees of freedom, which is not significant at the .05 level. The data series for the model generated was changed from 175.72 to 75.76 in 04-82 and from 206.14 to 120.54 in 08-84.

California Coast to Hawaii/Freeze/Container

1.	26.	.026
2.	0.	.000
3.	0.	.000
4.	24.	.024
5.	26.	.026
6.	0.	.000
7.	24.	.024
8.	23.	.023
9.	23.	.023
10.	24.	.024
11.	0.	.000
12.	23.	.023
13.	37.	.037
14.	0.	.000
15.	17.	.017
16.	0.	.000
17.	17.	.017
18.	16.	.016
19.	0.	.000
20.	50.	.050
21.	0.	.000
22.	16.	.016
23.	0.	.000
24.	0.	.000
25.	0.	.000
26.	0.	.000
27.	17.	.017
28.	0.	.000
29.	19.	.019
30.	0.	.000
31.	35.	.035
32.	0.	.000
33.	21.	.021
34.	40.	.040
35.	0.	.000
36.	38.	.038
37.	18.	.018
38.	0.	.000
39.	0.	.000
40.	20.	.020
41.	20.	.020
42.	0.	.000
43.	19.	.019
44.	20.	.020
45.	22.	.022
46.	0.	.000
47.	26.	.026
48.	42.	.042
49.	0.	.000
50.	48.	.048
51.	0.	.000
52.	0.	.000
53.	21.	.021
54.	22.	.022
55.	0.	.000
56.	26.	.026
57.	0.	.000
58.	26.	.025
59.	24.	.024
60.	22.	.022
61.	0.	.000
62.	22.	.022
63.	0.	.000
64.	22.	.022
65.	45.	.045
66.	0.	.000
67.	45.	.045
68.	0.	.000
69.	0.	.000
70.	21.	.021
71.	0.	.000
72.	46.	.046
73.	23.	.023
74.	46.	.046

California Coast to Hawaii/Freeze/Container

TIME DIFFERENCES

$$1-.74\,(1-B)^{1}\,(1-B)^{12}$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7794	.0923	8.45
2	TRANS	MA	2	12	.4433	.2004	2.21
3	TRANS	AR	1	1	-.3229	.1353	-2.39
4	TRANS	AR	1	4	-.1709	.1281	-1.33
5	TRANS	AR	2	12	-.3677	.2121	-1.73

FORECASTS		
85 10	.01076	.01886
85 11	.00775	.01945
85 12	.02654	.01963
86 1	.01481	.01963
86 2	.01731	.02012
86 3	.02306	.02021
86 4	.00924	.02044
86 5	.02298	.02068
86 6	.01916	.02082
86 7	.03347	.02104
86 8	.00944	.02120
86 9	.02684	.02212

SUM OF 12 FORECASTS = .22

The observed value for the Box-Pierce chi square is 21.62 with 19 degrees of freedom, which is not significant at the .05 level. The data series which was used to generate the model begins on 08-78. For 09-84 the tonnage value of 90.85 was replaced with 45.85.

California Coast to Hawaii/POV/Breakbulk

1.	1470.	1.470
2.	1753.	1.753
3.	1514.	1.514
4.	1923.	1.923
5.	2285.	2.285
6.	1761.	1.761
7.	1533.	1.533
8.	1806.	1.806
9.	2834.	2.834
10.	3747.	3.747
11.	3824.	3.824
12.	2268.	2.268
13.	1724.	1.724
14.	1543.	1.543
15.	2084.	2.084
16.	1624.	1.624
17.	1606.	1.606
18.	1714.	1.714
19.	1126.	1.126
20.	1306.	1.306
21.	1716.	1.716
22.	1405.	1.405
23.	2770.	2.770
24.	1155.	1.155
25.	1354.	1.354
26.	1144.	1.144
27.	917.	.917
28.	1003.	1.003
29.	2093.	2.093
30.	824.	.824
31.	1238.	1.238
32.	1924.	1.924
33.	1662.	1.662
34.	1889.	1.889
35.	1882.	1.882
36.	1393.	1.393
37.	1447.	1.447
38.	982.	.982
39.	947.	.947
40.	1661.	1.661
41.	1000.	1.000
42.	1013.	1.013
43.	1536.	1.536
44.	1383.	1.383
45.	2275.	2.275
46.	3276.	3.276
47.	2368.	2.368
48.	2535.	2.535
49.	1371.	1.371
50.	859.	.859
51.	1784.	1.784
52.	1283.	1.283
53.	1310.	1.310
54.	1451.	1.451
55.	1576.	1.576
56.	1381.	1.381
57.	2175.	2.175
58.	3272.	3.272
59.	2475.	2.475
60.	2560.	2.560
61.	1723.	1.723
62.	1124.	1.124
63.	2006.	2.006
64.	1825.	1.825
65.	1717.	1.717
66.	1560.	1.560
67.	1622.	1.622
68.	1586.	1.586
69.	2135.	2.135
70.	2553.	2.553
71.	2223.	2.223
72.	2423.	2.423
73.	2034.	2.034
74.	1470.	1.470
75.	1473.	1.473
76.	1961.	1.961
77.	1460.	1.460
78.	2243.	2.243
79.	1133.	1.133
80.	3064.	3.064
81.	3181.	3.181
82.	2787.	2.787
83.	3304.	3.304
84.	2577.	2.577

California Coast to Hawaii/POV/Breakbulk

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TIME      DIFFERENCES
                1       12
1-  84  (1-B  ) (1-B  )
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PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6888	.0870	7.92
2	TRANS	MA	2	12	.7858	.0451	17.43
3	TRANS	AR	1	4	-.2047	.1199	-1.71

FORECASTS

85 10	1.91675	.61851
85 11	1.72693	.64524
85 12	1.99350	.67090
86 1	2.02950	.67384
86 2	1.69874	.66951
86 3	1.81737	.70483
86 4	1.59532	.71983
86 5	2.11749	.73984
86 6	2.70318	.75567
86 7	3.15629	.77117
86 8	3.11840	.75637
86 9	2.45467	.83316

SUM OF 12 FORECASTS = 26.53

The observed value for the Box-Pierce chi square is 22.33 with 20 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/POV/Container

1.	7.	.007
2.	0.	.000
3.	8.	.008
4.	11.	.011
5.	20.	.020
6.	11.	.011
7.	2.	.002
8.	8.	.008
9.	13.	.013
10.	12.	.012
11.	4.	.004
12.	14.	.014
13.	3.	.003
14.	21.	.021
15.	19.	.019
16.	8.	.008
17.	10.	.010
18.	6.	.006
19.	17.	.017
20.	4.	.004
21.	3.	.003
22.	16.	.016
23.	27.	.027
24.	3.	.003
25.	13.	.012
26.	17.	.017
27.	5.	.005
28.	6.	.006
29.	6.	.008
30.	8.	.008
31.	3.	.003
32.	6.	.006
33.	14.	.014
34.	15.	.015
35.	9.	.009
36.	11.	.011
37.	10.	.010
38.	0.	.000
39.	11.	.011
40.	6.	.006
41.	24.	.024
42.	17.	.017
43.	5.	.005
44.	0.	.000
45.	22.	.022
46.	0.	.000
47.	18.	.018
48.	0.	.000
49.	14.	.014
50.	10.	.010
51.	13.	.013
52.	10.	.010
53.	6.	.006
54.	15.	.015
55.	0.	.000
56.	8.	.008
57.	0.	.000
58.	3.	.003
59.	3.	.003
60.	9.	.009

California Coast to Hawaii/POV/Container

TIME DIFFERENCES

1 12

1- 60 (1-B) (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8886	.0553	16.08
2	TRANS	MA	2	12	.6989	.1506	4.64
3	TRANS	AR	1	1	-.1496	.1235	-1.21
4	TRANS	AR	2	12	-.4494-001	.1950	-.23

FORECASTS		
85 10	.00745	.00962
85 11	.00704	.00969
85 12	.00848	.00973
86 1	.00295	.00977
86 2	.00686	.00982
86 3	.00606	.00986
86 4	.00251	.00991
86 5	-.00030	.00995
86 6	.00331	.00999
86 7	.00383	.01004
86 8	.01072	.01008
86 9	-.00155	.01064

SUM OF 12 FORECASTS = .06

The observed value for the Box-Pierce chi square is 15.69 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/Ammunition/Container

1.	5.	.005
2.	3.	.003
3.	95.	.095
4.	32.	.032
5.	83.	.083
6.	39.	.036
7.	17.	.017
8.	129.	.129
9.	3.	.003
10.	8.	.008
11.	25.	.025
12.	24.	.024
13.	67.	.067
14.	3.	.003
15.	0.	.000
16.	73.	.073
17.	54.	.054
18.	15.	.015
19.	24.	.024
20.	112.	.112
21.	4.	.004
22.	32.	.032
23.	32.	.032
24.	25.	.025
25.	25.	.025
26.	74.	.074
27.	53.	.053
28.	2.	.002
29.	36.	.036
30.	76.	.076
31.	0.	.000
32.	64.	.064
33.	0.	.000
34.	12.	.012
35.	6.	.006
36.	19.	.019
37.	13.	.013
38.	11.	.011
39.	16.	.016
40.	6.	.006
41.	0.	.000
42.	16.	.016
43.	10.	.010
44.	2.	.002
45.	11.	.011
46.	1.	.001
47.	2.	.002
48.	0.	.000
49.	0.	.000
50.	0.	.000
51.	6.	.006
52.	2.	.002
53.	0.	.000
54.	0.	.000
55.	19.	.019
56.	1.	.001
57.	0.	.000
58.	0.	.000
59.	1.	.001
60.	0.	.000
61.	2.	.002
62.	3.	.003
63.	3.	.003
64.	2.	.002
65.	3.	.003
66.	0.	.000
67.	6.	.006
68.	0.	.000
69.	10.	.010

California Coast to Hawaii/Ammunition/Container

TIME DIFFERENCES

1 12

1- 69 (1-B) (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.6983	.0972	7.18
2	TRANS	MA	2	12	.5571	.0877	6.35
3	TRANS	AR	1	1	-.5348	.1018	-5.25
4	TRANS	AR	1	2	-.5762	.0976	-5.90

FORECASTS

85 10	-.00525	.02668
85 11	-.01505	.02696
85 12	-.01059	.03011
86 1	-.00197	.03025
86 2	-.00924	.03028
86 3	-.00864	.03107
86 4	-.00851	.03146
86 5	-.00568	.03149
86 6	-.00958	.03178
86 7	-.00727	.03215
86 8	.00027	.03227
86 9	-.02153	.03562

SUM OF 12 FORECASTS = -.10

The observed value for the Box-Pierce chi square is 16.39 with 19 degrees of freedom, which is not significant at the .05 level. The data series used to generate this model begins on 01-79.

California Coast to Hawaii/General/Breakbulk

1.	36.	.036
2.	20.	.020
3.	6.	.006
4.	18.	.018
5.	31.	.031
6.	21.	.021
7.	107.	.107
8.	70.	.070
9.	49.	.049
10.	29.	.029
11.	160.	.160
12.	564.	.564
13.	56.	.056
14.	28.	.028
15.	1.	.001
16.	13.	.013
17.	72.	.072
18.	9.	.009
19.	127.	.127
20.	8.	.008
21.	1.	.001
22.	82.	.082
23.	80.	.080
24.	164.	.164
25.	2.	.002
26.	44.	.044
27.	11.	.011
28.	197.	.197
29.	33.	.033
30.	141.	.141
31.	3.	.003
32.	87.	.087
33.	5.	.005
34.	154.	.154
35.	2.	.002
36.	32.	.032
37.	158.	.158
38.	14.	.014
39.	8.	.008
40.	4.	.004
41.	0.	.000
42.	60.	.060
43.	119.	.119
44.	44.	.044
45.	32.	.032
46.	1.	.001
47.	32.	.032
48.	76.	.076
49.	10.	.010
50.	134.	.134
51.	0.	.000
52.	37.	.037
53.	4.	.004
54.	20.	.020
55.	311.	.311
56.	51.	.051
57.	0.	.000
58.	202.	.202
59.	15.	.015
60.	117.	.117
61.	61.	.061
62.	3.	.003
63.	71.	.071
64.	196.	.196
65.	29.	.029
66.	0.	.000
67.	29.	.029
68.	14.	.014
69.	27.	.027
70.	47.	.047
71.	0.	.000
72.	10.	.010
73.	40.	.040
74.	99.	.099
75.	0.	.000
76.	0.	.000
77.	59.	.059
78.	203.	.203
79.	77.	.077
80.	262.	.262
81.	129.	.129
82.	18.	.018
83.	53.	.053
84.	119.	.119

California Coast to Hawaii/General/Breakbulk

TIME DIFFERENCES

$$1-\ 84\ (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9013	.0445	20.23
2	TRANS	MA	2	12	.7674	.0488	15.71

FORECASTS

85 10	.06589	.12063
85 11	.06970	.12121
85 12	.03259	.12179
86 1	.07780	.12237
86 2	.04975	.12294
86 3	.08941	.12351
86 4	.12499	.12408
86 5	.11393	.12464
86 6	.06556	.12520
86 7	.08074	.12576
86 8	.07646	.12632
86 9	.22005	.13244

SUM OF 12 FORECASTS = 1.07

The observed value for the Box-Pierce chi square is 14.15 with 21 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/General/Container

1.	2921.	2.921
2.	3127.	3.127
3.	3753.	3.753
4.	3262.	3.262
5.	2940.	2.940
6.	3406.	3.406
7.	3000.	3.000
8.	3950.	3.950
9.	5429.	5.429
10.	3473.	3.473
11.	3277.	3.277
12.	3832.	3.832
13.	3198.	3.198
14.	4045.	4.045
15.	2279.	2.279
16.	2780.	2.780
17.	3562.	3.562
18.	4268.	4.268
19.	3354.	3.354
20.	5108.	5.108
21.	4711.	4.711
22.	3180.	3.180
23.	5470.	5.470
24.	3804.	3.804
25.	3261.	3.261
26.	3383.	3.383
27.	2714.	2.714
28.	2750.	2.750
29.	3110.	3.110
30.	3610.	3.610
31.	4679.	4.679
32.	5857.	5.857
33.	4224.	4.224
34.	3994.	3.994
35.	6070.	6.070
36.	3188.	3.188
37.	5355.	5.355
38.	3489.	3.489
39.	3195.	3.195
40.	4024.	4.024
41.	3811.	3.811
42.	4926.	4.926
43.	5122.	5.122
44.	5238.	5.238
45.	4540.	4.540
46.	5901.	5.901
47.	5368.	5.368
48.	6363.	6.363
49.	5039.	5.039
50.	4973.	4.973
51.	4900.	4.900
52.	1820.	1.820
53.	5541.	5.541
54.	5540.	5.540
55.	6830.	6.830
56.	5484.	5.484
57.	6352.	6.352
58.	8594.	8.594
59.	6379.	6.379
60.	5961.	5.961
61.	4742.	4.742
62.	4769.	4.769
63.	5750.	5.750
64.	4006.	4.006
65.	5138.	5.138
66.	6791.	6.791
67.	6697.	6.697
68.	5142.	5.142
69.	6197.	6.197
70.	6815.	6.815
71.	6110.	6.110
72.	7027.	7.027
73.	4866.	4.866
74.	5278.	5.278
75.	6337.	6.337
76.	5096.	5.096
77.	5390.	5.390
78.	7713.	7.713
79.	7115.	7.115
80.	8330.	8.330
81.	7534.	7.534
82.	5981.	5.981
83.	8231.	8.231
84.	7266.	7.266

California Coast to Hawaii/General/Container

```
TIME        DIFFERENCES
                 1        12
1-   84   (1-B   ) (1-B   )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8283	.0764	10.84
2	TRANS	MA	2	12	.8022	.0543	14.76
3	TRANS	AR	1	1	-.3240	.1283	-2.52
4	TRANS	AR	1	2	-.1795	.1291	-1.39

FORECASTS

85	10	6.11541	1.26774
85	11	6.53023	1.26881
85	12	6.14523	1.28995
86	1	5.37647	1.29653
86	2	6.13768	1.30314
86	3	7.13212	1.31166
86	4	7.10575	1.31946
86	5	7.41313	1.32707
86	6	7.69347	1.33480
86	7	7.26738	1.34246
86	8	7.53307	1.35005
86	9	7.28140	1.40554

SUM OF 12 FORECASTS = 81.73

The observed value for the Box-Pierce chi square is 24.17 with 19 degrees of freedom, which is not significant at the .05 level.

California Coast to Hawaii/HHG/Container

1.	864.	.864
2.	105.	.105
3.	143.	.143
4.	79.	.079
5.	115.	.115
6.	84.	.084
7.	57.	.057
8.	168.	.168
9.	210.	.210
10.	121.	.121
11.	286.	.286
12.	341.	.341
13.	146.	.146
14.	150.	.150
15.	91.	.091
16.	78.	.078
17.	173.	.173
18.	60.	.060
19.	94.	.094
20.	72.	.072
21.	113.	.113
22.	120.	.120
23.	67.	.067
24.	117.	.117
25.	134.	.134
26.	115.	.115
27.	113.	.113
28.	136.	.136
29.	61.	.061
30.	81.	.082
31.	118.	.118
32.	134.	.134
33.	70.	.070
34.	177.	.177
35.	159.	.159
36.	175.	.175
37.	105.	.105
38.	158.	.158
39.	90.	.090
40.	82.	.082
41.	71.	.071
42.	108.	.108
43.	86.	.087
44.	89.	.089
45.	104.	.104
46.	94.	.094
47.	73.	.073
48.	173.	.173
49.	113.	.113
50.	84.	.084
51.	77.	.077
52.	86.	.086
53.	118.	.118
54.	98.	.098
55.	146.	.146
56.	51.	.051
57.	86.	.086
58.	153.	.153
59.	220.	.220
60.	104.	.104
61.	132.	.132
62.	111.	.111
63.	79.	.079
64.	63.	.063
65.	99.	.099
66.	105.	.105
67.	71.	.071
68.	42.	.042
69.	67.	.067
70.	45.	.045
71.	243.	.243
72.	92.	.092

California Coast to Hawaii/HHG/Container

TIME DIFFERENCES

$$1-72 \quad (1-B^{1})(1-B^{12})$$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.8469	.0453	18.69
2	TRANS	MA	2	12	.3794	.0643	5.90

FORECASTS

85 10	.10905	.21837
85 11	.08712	.22086
85 12	.05949	.22331
86 1	.05082	.22575
86 2	.07862	.22815
86 3	.07989	.23053
86 4	.07008	.23289
86 5	.03057	.23522
86 6	.05453	.23753
86 7	.08861	.23982
86 8	.19582	.24208
86 9	.09992	.24410

SUM OF 12 FORECASTS = .97

The observed value for the Box-Pierce chi square is 10.10 with 21 degrees of freedom, which is not significant at the .05 level. The data series used to generate this model begins on 10-78.

California Coast to Hawaii/CONEX/Container

1.	0.	.000
2.	1.	.001
3.	0.	.000
4.	0.	.000
5.	0.	.000
6.	0.	.000
7.	0.	.000
8.	0.	.000
9.	0.	.000
10.	0.	.000
11.	0.	.000
12.	0.	.000
13.	0.	.000
14.	0.	.000
15.	0.	.000
16.	0.	.000
17.	0.	.000
18.	2.	.002
19.	0.	.000
20.	0.	.000
21.	0.	.000
22.	0.	.000
23.	0.	.000
24.	0.	.000
25.	0.	.000
26.	0.	.000
27.	0.	.000
28.	0.	.000
29.	0.	.000
30.	0.	.000
31.	0.	.000
32.	1.	.001
33.	0.	.000
34.	0.	.000
35.	0.	.000
36.	0.	.000
37.	0.	.000
38.	2.	.002
39.	2.	.002
40.	0.	.000
41.	1.	.001
42.	0.	.000
43.	0.	.000
44.	3.	.003
45.	2.	.002
46.	3.	.003
47.	1.	.001
48.	4.	.004
49.	7.	.007
50.	0.	.000
51.	1.	.001
52.	1.	.001
53.	0.	.000
54.	4.	.004
55.	4.	.004
56.	2.	.002
57.	2.	.002
58.	0.	.000
59.	0.	.000
60.	0.	.000
61.	1.	.001
62.	3.	.003
63.	5.	.005
64.	1.	.001
65.	1.	.001
66.	0.	.000
67.	0.	.000
68.	0.	.000
69.	0.	.000
70.	0.	.000
71.	8.	.008
72.	0.	.000
73.	1.	.001
74.	1.	.001
75.	1.	.001
76.	0.	.000
77.	2.	.002
78.	1.	.001
79.	0.	.000
80.	0.	.000
81.	0.	.000
82.	5.	.005
83.	9.	.009
84.	5.	.005

California Coast to Hawaii/CONEX/Container

TIME DIFFERENCES

$(1-B^{1})(1-B^{12})$

1- 84 (1-B) (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7894	.0638	9.42
2	TRANS	MA	2	12	.8029	.0485	16.57
3	TRANS	AR	1	4	-.3506	.1288	-2.72

FORECASTS

85 10	.00374	.00200
85 11	.00139	.00204
85 12	.00088	.00208
86 1	.00174	.00210
86 2	.00197	.00212
86 3	.00296	.00213
86 4	.00297	.00215
86 5	.00247	.00221
86 6	.00221	.00223
86 7	.00286	.00226
86 8	.00459	.00228
86 9	.00281	.00236

SUM OF 12 FORECASTS = .03

The observed value for the Box-Pierce chi square is 16.06 with 20 degrees of freedom, which is not significant at the .05 level. For 10-81 the tonnage value of 27.15 ws changed to 7.15.

California Coast to Hawaii/Special/Container

1.	6.	.006
2.	4.	.004
3.	12.	.012
4.	0.	.000
5.	10.	.010
6.	0.	.000
7.	0.	.000
8.	48.	.048
9.	0.	.000
10.	1.	.001
11.	1.	.001
12.	1.	.001
13.	0.	.000
14.	0.	.000
15.	10.	.010
16.	69.	.069
17.	32.	.032
18.	26.	.026
19.	17.	.017
20.	2.	.002
21.	1.	.001
22.	0.	.000
23.	16.	.016
24.	0.	.000
25.	0.	.000
26.	0.	.000
27.	0.	.000
28.	26.	.026
29.	3.	.003
30.	0.	.000
31.	38.	.038
32.	16.	.016
33.	4.	.004
34.	0.	.000
35.	0.	.000
36.	9.	.009
37.	10.	.010
38.	53.	.053
39.	15.	.015
40.	46.	.046
41.	4.	.004
42.	58.	.058
43.	18.	.018
44.	47.	.047
45.	16.	.016
46.	7.	.007
47.	6.	.006
48.	14.	.014
49.	0.	.000
50.	9.	.009
51.	6.	.006
52.	1.	.001
53.	0.	.000
54.	14.	.014
55.	16.	.016
56.	13.	.013
57.	0.	.000
58.	0.	.000
59.	0.	.000
60.	26.	.026
61.	1.	.001
62.	0.	.000
63.	1.	.001
64.	3.	.003
65.	5.	.005
66.	3.	.003
67.	1.	.001
68.	10.	.010
69.	0.	.000
70.	12.	.012
71.	27.	.027
72.	3.	.003
73.	4.	.004
74.	21.	.021
75.	6.	.006
76.	20.	.020
77.	12.	.012
78.	3.	.003
79.	3.	.003
80.	3.	.003
81.	15.	.015
82.	6.	.006
83.	2.	.002
84.	4.	.004

California Coast to Hawaii/Special/Container

```
TIME        DIFFERENCES
                  1        12
1-   84   (1-B    ) (1-B    )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9140	.0415	22.02
2	TRANS	MA	2	12	.8570	.0454	18.86
3	TRANS	AR	1	2	.1953	.1181	1.65

FORECASTS

85 10	-.00044	.01887
85 11	.00737	.01960
85 12	.00591	.01969
86 1	.01200	.01987
86 2	.00719	.01997
86 3	.00721	.02008
86 4	.00599	.02018
86 5	.02574	.02029
86 6	.00208	.02039
86 7	.00152	.02046
86 8	.00379	.02058
86 9	.00451	.02111

SUM OF 12 FORECASIS = .08

The observed value for the Box-Pierce chi square is 17.38 with 20 degrees of freedom, which is not significant at the .05 level.

Gulf Coast to Europe/General/Breakbulk

1.	831.	.831
2.	1020.	1.020
3.	3232.	3.232
4.	1495.	1.495
5.	1778.	1.778
6.	368.	.368
7.	1463.	1.463
8.	1629.	1.629
9.	2226.	2.226
10.	1753.	1.753
11.	360.	.360
12.	1670.	1.670
13.	437.	.437
14.	1375.	1.375
15.	2265.	2.265
16.	2130.	2.130
17.	914.	.914
18.	1135.	1.135
19.	1068.	1.068
20.	846.	.845
21.	1379.	1.379
22.	1816.	1.816
23.	3761.	3.761
24.	1755.	1.755
25.	1854.	1.854
26.	1465.	1.465
27.	1170.	1.170
28.	1315.	1.315
29.	675.	.675
30.	1158.	1.158
31.	2491.	2.491
32.	3105.	3.105
33.	1705.	1.705
34.	3415.	3.415
35.	5303.	5.303
36.	2069.	2.069
37.	428.	.428
38.	369.	.369
39.	389.	.389
40.	602.	.502
41.	193.	.193
42.	809.	.809
43.	894.	.894
44.	394.	.394
45.	591.	.591
46.	684.	.684
47.	3817.	3.817
48.	1314.	1.314
49.	150.	.150
50.	763.	.763
51.	1465.	1.465
52.	2115.	2.115
53.	1218.	1.218
54.	254.	.254
55.	116.	.116
56.	325.	.325
57.	45.	.044
58.	423.	.423
59.	2601.	2.601
60.	1257.	1.257
61.	4.	.004
62.	940.	.940
63.	293.	.293
64.	774.	.774
65.	339.	.339
66.	24.	.024
67.	75.	.075
68.	428.	.428
69.	131.	.131
70.	90.	.090
71.	3346.	3.346
72.	353.	.353

Gulf Coast to Europe/General/Breakbulk

		TIME	DIFFERENCES	
			12	
TRANS	RANDOM	1- 72	(1-B)	

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	12	.7507	.0602	12.48
2	TRANS	AR	1	1	.4723	.0968	4.88

FORECASTS		
85 10	.58575	1.27640
85 11	.95803	1.30211
85 12	1.48773	1.30777
86 1	1.34406	1.30903
86 2	.93900	1.30931
86 3	.46835	1.30938
86 4	.85289	1.30939
86 5	1.03615	1.30939
86 6	.94384	1.30940
86 7	1.11706	1.30940
86 8	2.83014	1.30940
86 9	1.65135	1.34067

SUM OF 12 FORECASTS = 14.14

The observed value of the Box-Pierce chi square is 21.53 with 22 degrees of freedom, which is not significant at the .05 level. The data series used to generate the model begins on 10-78.

Gulf Coast to Europe/General/Container

1.	4646.	4.646
2.	5685.	5.685
3.	4010.	4.010
4.	4618.	4.618
5.	4375.	4.375
6.	4465.	4.465
7.	3352.	3.352
8.	3775.	3.775
9.	3373.	3.373
10.	5155.	5.155
11.	3142.	3.142
12.	3229.	3.229
13.	5355.	5.355
14.	2225.	2.225
15.	2656.	2.656
16.	4415.	4.415
17.	4161.	4.161
18.	2604.	2.604
19.	4604.	4.604
20.	5122.	5.122
21.	3908.	3.908
22.	3686.	3.686
23.	5094.	5.094
24.	3039.	3.039
25.	4461.	4.461
26.	2868.	2.868
27.	3311.	3.311
28.	3579.	3.579
29.	4248.	4.248
30.	3308.	3.308
31.	4948.	4.948
32.	3380.	3.380
33.	5320.	5.320
34.	5975.	5.975
35.	4958.	4.958
36.	3758.	3.758
37.	3138.	3.138
38.	3156.	3.156
39.	3530.	3.530
40.	7765.	7.765
41.	5831.	5.831
42.	2313.	2.313
43.	2846.	2.846
44.	3031.	3.031
45.	2033.	2.033
46.	4224.	4.224
47.	4679.	4.679
48.	5226.	5.226
49.	4932.	4.932
50.	3578.	3.578
51.	2009.	2.009
52.	2905.	2.905
53.	3395.	3.395
54.	3009.	3.009
55.	4471.	4.471
56.	3535.	3.535
57.	3661.	3.661
58.	3516.	3.516
59.	3576.	3.576
60.	2584.	2.584

Gulf Coast to Europe/General/Container

```
                    TIME      DIFFERENCES
                                   1
                    1-  60  (1-8  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE       ST. ERR.  T-RATIO
    1   TRANS         MA     1       1      .9636         .0144     67.33


             FORECASTS
             85 10            3.94317         1.15157
             85 11            3.94317         1.16233
             85 12            3.94317         1.16310
             86  1            3.94317         1.16386
             86  2            3.94317         1.16463
             86  3            3.94317         1.16539
             86  4            3.94317         1.16616
             86  5            3.94317         1.16692
             86  6            3.94317         1.16769
             86  7            3.94317         1.16845
             86  8            3.94317         1.16921
             86  9            3.94317         1.16997
             SUM OF 12 FORECASTS =      47.28
```

The observed value of the Box-Pierce chi square is 34.56 with 34 degrees of freedom, which is not significant at the .05 level. The data series used to generate the model begins on 10-79.

Gulf Coast to Europe/HHG/Container

1.	13884.	13.884
2.	3358.	3.358
3.	3220.	3.220
4.	2709.	2.709
5.	5973.	5.973
6.	1255.	1.255
7.	2076.	2.076
8.	6558.	6.558
9.	5456.	5.456
10.	2045.	2.045
11.	23974.	23.974
12.	1816.	1.816
13.	19266.	19.266
14.	12669.	12.669
15.	37186.	37.186
16.	40071.	40.071
17.	17689.	17.689
18.	6206.	6.206
19.	10150.	10.150
20.	10085.	10.085
21.	18576.	18.576
22.	5324.	5.324
23.	1903.	1.903
24.	12672.	12.672
25.	2407.	2.407
26.	15837.	15.837
27.	9101.	9.101
28.	10731.	10.731
29.	9118.	9.118
30.	19753.	19.753
31.	10453.	10.453
32.	14827.	14.827
33.	11253.	11.253
34.	28994.	28.994
35.	24030.	24.030
36.	25349.	25.349
37.	19992.	19.992
38.	11095.	11.095
39.	30655.	30.655
40.	14572.	14.572
41.	20456.	20.458
42.	12508.	12.508
43.	27538.	27.539
44.	5305.	5.305
45.	5961.	5.961
46.	11917.	11.917
47.	16278.	16.278
48.	1331.	1.331
49.	4540.	4.540
50.	13201.	13.201
51.	1293.	1.293
52.	9723.	9.723
53.	2248.	2.248
54.	6304.	6.304
55.	6343.	6.343
56.	4176.	4.176
57.	6638.	6.638
58.	1657.	1.657
59.	19287.	19.287
60.	8032.	8.332
61.	0.	.000
62.	14745.	14.745
63.	4191.	4.191
64.	6155.	6.155
65.	1522.	1.522
66.	7673.	7.673
67.	13351.	13.351
68.	2694.	2.694
69.	2617.	2.617
70.	441.	.441
71.	11278.	11.278
72.	10697.	10.688
73.	7999.	7.999
74.	1906.	1.976
75.	10787.	10.787
76.	3601.	3.601
77.	5933.	5.933
78.	3554.	3.554
79.	7290.	7.290
80.	6440.	6.440
81.	0.	.000
82.	6558.	6.558
83.	37914.	37.915
84.	422.	.422

Gulf Coast to Europe/HHG/Container

```
TIME        DIFFERENCES
                 1
1-  84   (1-B  )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.7689	.0704	10.92

FORECASTS

85 10	12.73389	9.01907
85 11	12.73389	9.24478
85 12	12.73389	9.46511
86 1	12.73389	9.68043
86 2	12.73389	9.89107
86 3	12.73389	10.09730
86 4	12.73389	10.29942
86 5	12.73389	10.49764
86 6	12.73389	10.69218
86 7	12.73389	10.88325
86 8	12.73389	11.07102
86 9	12.73389	11.25566

SUM OF 12 FORECASTS = 152.45

The observed value of the Box-Pierce chi square is 17.77 with 34 degrees of freedom, which is not significant at the .05 level.

Gulf Coast to Europe/Special/Breakbulk

1.	15.	.015
2.	0.	.000
3.	1443.	1.449
4.	440.	.440
5.	352.	.352
6.	653.	.653
7.	470.	.470
8.	354.	.354
9.	534.	.534
10.	619.	.619
11.	807.	.807
12.	814.	.814
13.	646.	.548
14.	336.	.336
15.	468.	.468
16.	52.	.052
17.	454.	.454
18.	179.	.179
19.	420.	.420
20.	407.	.407
21.	538.	.538
22.	415.	.415
23.	239.	.239
24.	517.	.517
25.	373.	.373
26.	531.	.531
27.	465.	.465
28.	684.	.684
29.	433.	.433
30.	1005.	1.005
31.	847.	.847
32.	363.	.363
33.	250.	.250
34.	692.	.692
35.	688.	.683
36.	195.	.195
37.	635.	.635
38.	240.	.240
39.	279.	.279
40.	747.	.747
41.	342.	.342
42.	296.	.295
43.	490.	.490
44.	491.	.491
45.	407.	.407
46.	467.	.467
47.	523.	.523
48.	444.	.444
49.	343.	.343
50.	415.	.415
51.	234.	.234
52.	404.	.404
53.	282.	.292
54.	385.	.385
55.	250.	.250
56.	310.	.310
57.	547.	.547
58.	436.	.436
59.	613.	.613
60.	316.	.316
61.	220.	.220
62.	484.	.484
63.	297.	.297
64.	194.	.194
65.	0.	.000
66.	0.	.000
67.	322.	.322
68.	432.	.432
69.	215.	.215
70.	576.	.576
71.	591.	.591
72.	625.	.625
73.	647.	.647
74.	373.	.373
75.	202.	.202
76.	0.	.000
77.	577.	.577
78.	323.	.323
79.	407.	.407
80.	102.	.102
81.	156.	.156
82.	446.	.446
83.	257.	.257
84.	347.	.347

Gulf Coast to Europe/Special/Breakbulk

TIME DIFFERENCES
1
1- B4 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	1	.9498	.0325	29.18

FORECASTS

85 10	.35177	.28587
85 11	.35177	.28623
85 12	.35177	.28659
86 1	.35177	.28695
86 2	.35177	.28730
86 3	.35177	.28766
86 4	.35177	.28802
86 5	.35177	.28837
86 6	.35177	.28873
86 7	.35177	.28908
86 8	.35177	.28944
86 9	.35177	.28979

SUM OF 12 FORECASTS = 4.22

The observed value of the Box-Pierce chi square is 25.33 with 34 degrees of freedom, which is not significant at the .05 level.

East Coast to English Isles/Freeze/Container

1.	113.	.113
2.	35.	.035
3.	32.	.032
4.	74.	.074
5.	10.	.010
6.	30.	.030
7.	9.	.009
8.	24.	.024
9.	77.	.077
10.	206.	.206
11.	39.	.039
12.	34.	.034
13.	51.	.051
14.	21.	.021
15.	37.	.037
16.	67.	.067
17.	30.	.030
18.	28.	.028
19.	23.	.023
20.	54.	.054
21.	38.	.038
22.	105.	.105
23.	132.	.132
24.	62.	.062
25.	50.	.050
26.	64.	.064
27.	24.	.024
28.	68.	.068
29.	14.	.014
30.	9.	.009
31.	17.	.017
32.	55.	.055
33.	184.	.184
34.	84.	.084
35.	163.	.163
36.	146.	.146
37.	27.	.027
38.	17.	.017
39.	9.	.009
40.	22.	.022
41.	47.	.047
42.	22.	.022
43.	57.	.057
44.	68.	.068
45.	94.	.094
46.	188.	.188
47.	117.	.117
48.	68.	.068
49.	45.	.045
50.	30.	.029
51.	21.	.021
52.	44.	.044
53.	53.	.053
54.	15.	.015
55.	91.	.091
56.	87.	.087
57.	95.	.095
58.	235.	.235
59.	139.	.139
60.	87.	.087
61.	40.	.040
62.	55.	.055
63.	0.	.000
64.	57.	.057
65.	18.	.018
66.	25.	.025
67.	70.	.070
68.	92.	.092
69.	110.	.110
70.	187.	.187
71.	140.	.140
72.	104.	.104
73.	54.	.054
74.	0.	.000
75.	53.	.053
76.	49.	.049
77.	20.	.020
78.	81.	.081
79.	61.	.061
80.	75.	.075
81.	162.	.162
82.	38.	.038
83.	130.	.130
84.	57.	.057

East Coast to English Isles/Freeze/Container

TIME DIFFERENCES
12
1- 94 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	TRANS	MA	1	12	.5643	.1006	5.61
2	TRANS	MA	1	24	.2463	.1009	2.44

FORECASTS

85 10	.06795	.04446
85 11	.01914	.04446
85 12	.03820	.04446
86 1	.05598	.04446
86 2	.02238	.04446
86 3	.04393	.04446
86 4	.04454	.04446
86 5	.05881	.04446
86 6	.12161	.04446
86 7	.12277	.04446
86 8	.10523	.04446
86 9	.05337	.04850

SUM OF 12 FORECASTS = .77

The observed value of the Box-Pierce chi square is 27.72 with 20 degrees of freedom, which is not significant at the .05 level.

APPENDIX I

BOX-JENKINS SOFTWARE

Five large runstreams were written so that analyzing the time series with the B-J methodology would be a process that would be nearly automatic and very efficient. These runstreams include: BJII.EXPDFP, BJII.EXPMOD, BJII.EXPLN, BJII.MODP, BJII.FORP. Included within this appendix is an explanation of the function of each of these runstreams in the B-J analysis process.

a. BJII.EXPDFP. BJII.EXPDFP (see Figure I-1) is a runstream that drives the BMDP package to produce background information about the time series being analyzed. This information is useful in identification of the model which is appropriate to the time series. The following items are produced:

(1) A graphical display of the 3-, 6-, and 12-month moving averages of the original observations,

(2) A plot of the original observations (by month) and plots of the observations differenced by 1 month, 2 months, 12 months, both 1 and 12 months, and both 2 and 12 months. The natural log of the original observations is taken, and these 5 plots are repeated,

(3) For each one of the differencing methods described above, descriptive statistics about the autocorrelation function (ACF) and partial autocorrelation functions (PACF) are produced. Also, the plots of the autocorrelations over the first 36 lags are printed out for both the ACF and the PACF.

(4) Finally a histogram of the observations grouped by fiscal year is plotted. With this histogram and test statistics accompanying it, possible outliers in the original data can be identified.

b. BJII.EXPMOD

(1) This runstream is designed to help identify models which characterize the time series being analyzed. For at least three-quarters of the time series that were analyzed, it was possible to identify at least one model that could be considered an effective characterization of the time series simply by examining the output generated by this runstream alone. BJII.EXPMOD (see Figure I-2) drives the BMDP package to analyze the time series with 36 basic ARIMA ("integrated autoregressive moving average") models. For each one of the 36 models the output includes plots of the autocorrelation and partial autocorrelation functions, estimates of the parameter values of the model, and the mean square of the residual between each of the observed and expected values.

```
@ . N7BJII.EXPDFP       FROM N7BJ.P2TRUN
@ . DATA IS N7FULL.0327158
@FREE          N7PRTC.
@DELETE        N7PRTC.
@CAT,P         N7PRTC,F50
@ASG,A         N7PRTC.
@BRKPT         PRINT$/N7PRTC
@HDG,U         THIS PRINT-OUT IS UNCLASSIFIED
@ASG,A         N7BJII.
@PRT,S N7BJII.EXPDFP
@LIB$*BMDP82.P1T
/BMDP1T
/PROBLEM       TITLE IS '0327158  TONNAGE  BOX JENKINS FORECASTS FY86'.
/INPUT         VARIABLES ARE 3.
               FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE      NAMES ARE SAILYR,MONTH,TONNAGE,TRANS.
               ADD = 1.
/TRANSFORM     TRANS = TONNAGE/1000.
/END
@ADD,P         N7FULL.0327153
/END
 SNAPSHOT      VARIABLE IS TRANS.
               SPAN = 3.
               PRINT./
 SNAPSHOT      VARIABLE IS TRANS.
               SPAN = 6.
               PRINT./
 SNAPSHOT      VARIABLE IS TRANS.
               SPAN = 12.
               PRINT./
END/
@LIB$*BMDP82.P2T
/BMDP2T
/PROBLEM       TITLE IS '0327158  TONNAGE  BOX JENKINS FORECASTS FY86'.
/INPUT         VARIABLE IS 3.
               FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE      NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
               ADD = 2.
/TRANSFORM     TRANS = TONNAGE/1000.
               TRANSLN = LN(TONNAGE).
/END
@ADD,P N7FULL.0327158
/END
TPLOT          VARIABLE IS TONNAGE.
               SYMBOLS ARE O,N,D,J,F,M,A,M,J,J,A,S./
ACF            VARIABLE IS TONNAGE./
PACF           VARIABLE IS TONNAGE./
DIFFERENCE     OLD = TRANS.
               NEW = TRANSDF.
               DFORDER = 1./
TPLOT          VARIABLE IS TRANSDF./
ACF            VARIABLE IS TRANS.
               DFORDER = 1./
PACF           VARIABLE IS TRANS.
               DFORDER = 1./
DIFFERENCE     OLD = TRANS.
               NEW = TRANSDF.
               DFORDER = 1./
TPLOT          VARIABLE IS TRANSDF./
ACF            VARIABLE IS TRANS.
               DFORDER = 1./
PACF           VARIABLE IS TRANS.
               DFORDER = 1./
DIFFERENCE     OLD = TRANS.
               NEW = TRANSDF.
               DFORDER = 2./
TPLOT          VARIABLE IS TRANSDF./
ACF            VARIABLE IS TRANS.
               DFORDER = 2./
PACF           VARIABLE IS TRANS.
               DFORDER = 2./
DIFFERENCE     OLD = TRANS.
               NEW = TRANSDF.
               DFORDER = 12./
TPLOT          VARIABLE IS TRANSDF./
ACF            VARIABLE IS TRANS.
```

Figure I-1. N7BJII.EXPDFP
(page 1 of 2 pages)

```
                    DFORDER = 12./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12./
     DIFFERENCE     OLD = TRANS.
                    NEW = TRANSDF.
                    DFORDER = 1,12./
     TPLOT          VARIABLE IS TRANSDF./
     ACF            VARIABLE IS TRANS.
                    DFORDER = 12,1./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12,1./
     DIFFERENCE     OLD = TRANS.
                    NEW = TRANSDF.
                    DFORDER = 2,12./
     TPLOT          VARIABLE IS TRANSDF./
     ACF            VARIABLE IS TRANS.
                    DFORDER = 12,2./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12,2./
     DIFFERENCE     OLD = TRANS.
                    NEW = TRANSDF.
                    DFORDER = 12./
     TPLOT          VARIABLE IS TRANSDF./
     ACF            VARIABLE IS TRANS.
                    DFORDER = 12./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12./
     DIFFERENCE     OLD = TRANS.
                    NEW = TRANSDF.
                    DFORDER = 12,1./
     TPLOT          VARIABLE IS TRANSDF./
     ACF            VARIABLE IS TRANS.
                    DFORDER = 12,1./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12,1./
     DIFFERENCE     OLD = TRANS.
                    NEW = TRANSDF.
                    DFORDER = 12,2./
     TPLOT          VARIABLE IS TRANSDF./
     ACF            VARIABLE IS TRANS.
                    DFORDER = 12,2./
     PACF           VARIABLE IS TRANS.
                    DFORDER = 12,2./
     END/
     @LIB$*BMDP82.P7D
     /BMDP7D
     /PROBLEM       TITLE IS '0327153  TONNAGE  BOX JENKINS FORECASTS FY86'.
     /INPUT         VARIABLES ARE 3.
                    FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
     /VARIABLE      NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANLN,DATE.
                    ADD = 3.
     /GROUP         CUTPOINTS(6) ARE 7809,7909,8009,8109,8209,8309,8409.
     /TRANSFORM     TRANS = TONNAGE/1000.
                    TRANLN = LN(TONNAGE).
                    DATE=(SAILYR*100)+MONTH.
     /HISTOGRAM     GROUP = DATE.
                    VARIABLE = TRANS,TRANLN.
     /PRINT         CORR.
                    DATA.
                    ORDER.
                    TTEST.
                    PLOT.
     /END
     @ADD,P         N7FULL.0327153
     /END
     @BRKPT         PRINT$
     @SYM           N7PRTC,1,PR
```

Figure I-1. N7BJII.EXPDFP
(page 2 of 2 pages)

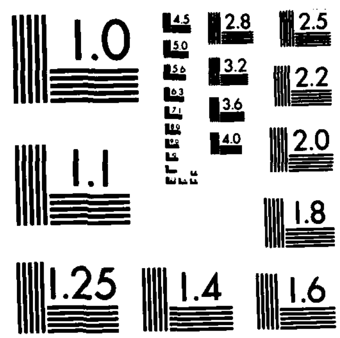
AD-A160 430 TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD H D FREAR ET AL AUG 85

UNCLASSIFIED CAA-SR-85-11 F/G 15/5 NL

END

FILMED

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
@ : N7BJII.EXPMOD
@ : DATA IS N7FULL.0327158
@FREE          N7PRTD.
@DELETE        N7PRTD.
@CAT,P         N7PRTD,F50
@ASG,A         N7PRTD.
@BRKPT         PRINT$/N7PRTD
@HDG,U         THIS PRINT-OUT IS UNCLASSIFIED
@ASG,A         N7BJII.
@PACK N7BJII.
@PRT,S N7BJII.EXPMOD
@LIB$*BMDP82.P2T
/BMDP2T
/PROBLEM       TITLE IS '0327158 TONNAGE BOX JENKINS FORECASTS FY86'.
/INPUT         VARIABLES ARE 3.
               FORMAT IS '(1X,F2.0,F2.0,F13.2)'.
/VARIABLE      NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
               ADD = 2.
/TRANSFORM     TRANS = TONNAGE/1000.
               TRANSLN = LN(TONNAGE).
/END
@ADD,P N7FULL.0327158
/END
ARIMA          VAR = TRANS.
               MAORDERS ARE '(1)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               MAORDERS ARE '(1,2)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               MAORDERS ARE '(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               MAORDERS ARE '(1),(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               ARORDERS ARE '(1)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               ARORDERS ARE '(1,2)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               ARORDERS ARE '(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               ARORDERS ARE '(1),(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               ARORDERS ARE '(1)'.
               MAORDERS ARE '(1)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               DFORDER ARE 1.
               MAORDERS ARE '(1)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               DFORDER ARE 1.
               MAORDERS ARE '(1,2)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               DFORDER ARE 1.
               MAORDERS ARE '(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               DFORDER ARE 1.
               MAORDERS ARE '(1),(12)'./
ESTIMATION     RESIDUAL = RES./
ACF            VARIABLE IS RES./
ARIMA          VAR = TRANS.
               DFORDER ARE 1.
               ARORDERS ARE '(1)'./
ESTIMATION     RESIDUAL = RES./
```

Figure I-2. N7BJII.EXPMOD
(page 1 of 3 pages)

```
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            ARORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            ARORDERS ARE '(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            ARORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            ARORDERS ARE '(1)'.
            MAORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            MAORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            MAORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            MAORDERS ARE '(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            MAORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            ARORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            ARORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            ARORDERS ARE '(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            ARORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 12.
            ARORDERS ARE '(1)'.
            MAORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
ARIMA       VAR = TRANS.
```

Figure I-2. N7BJII.EXPMOD
(page 2 of 3 pages)

```
                        DFORDER ARE 1,12.
                        MAORDERS ARE '(1),(12)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          ARIMA         VAR = TRANS.
                        DFORDER ARE 1,12.
                        ARORDERS ARE '(1)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          ARIMA         VAR = TRANS.
                        DFORDER ARE 1,12.
                        ARORDERS ARE '(1,2)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          ARIMA         VAR = TRANS.
                        DFORDER ARE 1,12.
                        ARORDERS ARE '(12)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          ARIMA         VAR = TRANS.
                        DFORDER ARE 1,12.
                        ARORDERS ARE '(1),(12)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          ARIMA         VAR = TRANS.
                        DFORDER ARE 1,12.
                        ARORDERS ARE '(1)'.
                        MAORDERS ARE '(1)'./
          ESTIMATION    RESIDUAL = RES./
          ACF           VARIABLE IS RES./
          END/
          @BRKPT        PRINT$
          @SYM,U        N7PRTD,1,PR
          @KEEP N7PRTD.
          @BKI U
          @PRT,S N7BJII.EXPMOD
          @USE 10.,N7PRTD.
          @XQT N7BJII.B$1SYMABS
          R
```

Figure I-2. N7BJII.EXPMOD
(page 3 of 3 pages)

(2) One of the main reasons that the use of this runstream improves the efficiency of the B-J analysis is that it drives N7BJII.READ (see Figure I-3). N7BJII.READ is a FORTRAN program that reads the output from the BMDP package, generated above, and computes the following important statistics that are not available from BMDP:

(a) Most importantly, the sum of the squares of the autocorrelations (corresponding to the 36 different time lags) is calculated. Using this sum, the Box-Pierce test for adequacy of a B-J model can be easily evaluated.

(b) This program also outputs the differences between the forecasts and the observed values of the final 12 months of the time series. These differences are used to calculate the root mean square in the "backcasting" process when evaluating the effectiveness of a B-J model.

c. BJII.EXPLN. This runstream is nearly identical to the BJII.EXPMOD runstream; however, the 36 ARIMA models are applied to the time series that have been transformed by the natural log function. This runstream is applicable to time series that have observations which show evidence of having a variance that is a function of their size.

d. BJII.MODP. This runstream is used once one or several ARIMA models have been selected as effectively characterizing the time series being analyzed, from BJII.EXPDF, BJII.EXPMOD, and/or BJII.EXPLN. Its function is to refine and build on the model(s) that were identified. Unlike the other three runstreams, BJII.MODP (see Figure I-4) is not highly automated, since it requires specific modification as indicated by analysis done with the first two or three runstreams. With this runstream and use of the previous three runstreams the model that best characterizes the time series is chosen.

e. BJII.FORP. Once the appropriate model has been determined, this runstream (see Figure I-5) is used to generate the 12-month forecast. Along with the monthly forecasts this runstream generates:

(1) The estimates of the parameters that define the model with their associated test statistics.

(2) Plots of the 3-, 6-, and 12-month moving averages.

(3) Plots of the autocorrelation and partial autocorrelation functions that are based on the original observations and the expected observations as specified in the final model. This output, along with its associated test statistics, are the checks on the model. If they fail, there has been an error in the analysis, and a new model must be determined.

```
C N7BJII.READ    A READ PRINTS PROGRAM
      DIMENSION X(35),AMINF(25),IT1(12),IT2(12)
      DIMENSION Y(25),Z(120),PER(25),FOR(25),SE(25),ACT(25),LV(25)
      DIMENSION RES(84,5)
      REAL LV
      CHARACTER*4 A,M,AZ(60)
      CHARACTER*4 AX,Z,OUT
      CHARACTER*8 RX(84)
      DATA IT1/3*85,9*86/
      DATA IT2/10,11,12,1,2,3,4,5,6,7,8,9/
      OPEN (10)
      OPEN(20)
      READ(5,1)OUT
      READ(5,50)R1,R2,C,M,(AZ(J),J=1,60)
      WRITE(6,51)R1,R2,C,M,(AZ(J),J=1,60)
      IF(OUT.EQ.'W')WRITE(20,50)R1,R2,C,M,(AZ(J),J=1,60)
   52 FORMAT(/,' POE= ',I4,' POD= ',I4,' COMMODITY = ',I4,
     1' MODE = ',A1,//)
      WRITE(6,52)R1,R2,C,M
      IF(OUT.EQ.'W')WRITE(20,52)R1,R2,C,M
   50 FORMAT(3I2,A1,60A1)
   51 FORMAT(10X,3I2,A1,10X,60A1,/)
    1 FORMAT(120A1)
    2 FORMAT(1X,120A1)
    3 FORMAT(A4,42X,A4)
    4 FORMAT(/,10X,12F5.2,///,10X,12F5.2,///,10X,12F5.2)
   44 FORMAT(/,10X,12F5.2,//,10X,12F5.2,//,10X,12F5.2)
   21 FORMAT(I4)
   23 FORMAT(A4)
  350 FORMAT(I1)
  351 FORMAT(1X,3I4)
 2000 READ(10,23,END=100)A
      IF(A.NE.'ARIM')GO TO 2000
 1000 READ(10,3,END=100)A,AX
      IF(A.EQ.'NUMB')THEN
            DECODE(21,AX)IX
            XN=IX
C           WRTTE(6,20)XN
            SS=0.
            GO TO 1000
   20 FORMAT(' YN= ',F5.0)
      ELSE IF(A.EQ.'RESI')THEN
      READ(10,60)A,AX
C     WRITE(6,222)A,AX
  222 FORMAT(1X,A4,1X,A4)
   60 FORMAT(////,A4,10X,A4)
      IF(A.EQ.'ESTI'.AND.AX.EQ.'BACK')THEN
C     WRITE(6,222)A,AX
            WRITE(6,61)
      ISW=1
   61 FORMAT(' ESTIMATION BY BACKCASTING METHOD')
  400 READ(10,1,END=100)(Z(J),J=1,120)
      WRITE(6,2)(Z(J),J=1,120)
      IF(OUT.EQ.'W')WRITE(20,2)(Z(J),J=1,120)
      IF(Z(1).EQ.'T')THEN
      DECODE(350,Z(35))I10
      DECODE(350,Z(36))I1
      IN=(I10*10)+I1
      WRITE(6,351)I10,I1,IN
      END IF
      IF(Z(10).NE.'M'.OR.Z(15).NE.'S')THEN
      IF(Z(6).EQ.'L'.AND.Z(7).EQ.'N')ISW=2
C     WRITE(6,2)Z(5),Z(7)
      GO TO 400
      END IF
            END IF
      GO TO 1000
      ELSE IF(A.EQ.'AUTO')THEN
            READ(10,4)(X(J),J=1,36)
            WRITE(6,44)(X(J),J=1,36)
      DO 10 J=1,36
   10 SS=SS+(X(J)*X(J))
      CHI0=SS*XN
      CHI1=SS*(XN-1)
      CHI12=SS*(XN-12)
      CHI13=SS*(XN-13)
      WRITE(6,24)XN,SS,CHI0,CHI1,CHI12,CHI13
      IF(OUT.EQ.'W')WRITE(20,224)XN
  224 FORMAT(/,' N= ',F4.0,/)
   24 FORMAT(' N= ',F4.0,60X,' SS= ',F8.4,/,
     1' CHI0,CHI1,CHI12,CHI13',5X,4F10.2)
```

Figure I-3. N7BJII.READ
(page 1 of 3 pages)

```
            GO TO 1000
      ELSE IF (A.EQ.'FORE')THEN
      DO 30 J=1,5
      READ(10,1)(Z(JJ),JJ=1,120)
   30 WRITE(6,2)(Z(JJ),JJ=1,120)
      ISW=1
      IF(Z(28).EQ.'L'.AND.Z(29).EQ.'N')ISW=2
      WRITE(6,2)Z(28),Z(29)
      DO 39 J=1,2
      READ(10,1)(Z(JJ),JJ=1,120)
   39 WRITE(6,2)(Z(JJ),JJ=1,120)
      SUMF=0
      SUMA=0
      SUMAF=0
      SUMLN=0.
      DO 33 J=1,13
      READ(10,31)PER(J),FOR(J),SE(J),ACT(J)
   31 FORMAT(1X,I4,9X,F10.5,5X,F10.5,5X,F10.5,5X,F10.5,5X,F10.5)
      IF(ISW.EQ.2)THEN
      IF(FOR(J).GT. 0. .AND. FOR(J) .LT. 25.)
     1LN(J)=EXP(FOR(J))/1000.
      END IF
      AMINF(J)=ACT(J)-FOR(J)
   33 WRITE(6,31)PER(J),FOR(J),SE(J),ACT(J),LN(J),AMINF(J)
      DO 333 J=2,13
      SUMF=SUMF+FOR(J)
      SUMA=SUMA+ACT(J)
      SUMAF=SUMAF+AMINF(J)
      SUMLN=SUMLN+LN(J)
  333 CONTINUE
  334 FORMAT(/,' SUM OF 12 FORECASTS = ',F10.2,
     1' SUM OF 12 ANTILOGS/1000 ',F10.2)
      WRITE(6,334)SUMF,SUMLN
      IF(OUT.EQ.'W')THEN
      WRITE(20,371)
  371 FORMAT(' FORECASTS')
      DO 335 J=2,13
      JJ=J-1
      IF(ISW.EQ.2)THEN
      WRITE(20,331)IT1(JJ),IT2(JJ),FOR(J),SE(J),LN(J)
      GO TO 335
      END IF
      WRITE(20,331)IT1(JJ),IT2(JJ),FOR(J),SE(J)
  335 CONTINUE
      IF(OUT.EQ.'W')WRITE(20,334)SUMF,SUMLN
  331 FORMAT(1X,I2,1X,I2,9X,F10.5,5X,F10.5,5X,F10.5,5X,F10.5,5X,F10.5)
      END IF
      GO TO 1000
      ELSE IF(A.EQ.'PRIN')THEN
      WRITE(6,353)IN
  353 FORMAT(' N= ',I4)
      IF(OUT.EQ.'W')WRITE(20,353)IN
      DO 355 I=1,4
      READ(10,1)(Z(JJ),JJ=1,120)
      WRITE(6,2)(Z(JJ),JJ=1,120)
      IF(OUT.EQ.'W')WRITE(20,2)(Z(JJ),JJ=1,120)
  355 CONTINUE
      IF(OUT.EQ.'W')THEN
      IF(ISW.EQ.1)WRITE(20,340)
      IF(ISW.EQ.2)WRITE(20,341)
  340 FORMAT(' TRANS=TONNAGE/1000')
  341 FORMAT(' LN:  TRANSLN=LN(TONNAGE)')
      END IF
      RSUM=0
      RSS=0
      DO 356 I=1,IN
      READ(10,360)(RES(I,J),J=1,3),RX(I),RES(I,5)
  360 FORMAT(1X,F4.0,11X,F10.0,1X,F10.0,1X,2X,A8,1X,F10.0)
      IF(RX(I).EQ.'MISSING ')THEN
      RES(I,4)=(-0.0)
      ELSE
            DECODE(370,RX(I))RES(I,4)
  370 FORMAT(F6.3)
      END IF
 3360 FORMAT(1X,F4.0,1X,F10.0,1X,F10.3,1X,F10.4,1X,F10.4)
      WRITE(6,3360)(RES(I,J),J=1,5)
      RSUM=RSUM+RES(I,5)
      RSS=RSS+(RES(I,5)*RES(I,5))
      IF(OUT.EQ.'W')WRITE(20,3360)(RES(I,J),J=1,5)
  356 CONTINUE
  401 FORMAT(' RSUM=',F10.2)
  402 FORMAT(' RSUM/XN= ',F10.2)
```

Figure I-3. N7BJII.READ
(page 2 of 3 pages)

```
  403 FORMAT(' RSS= ',F10.2)
      WRITE(6,401)RSUM
C     RSUM=RSUM/XN
      WRITE(6,432)RSUM
      WRITE(6,403)RSS
C     RSS=RSS/XN
      WRITE(6,403)RSS
      GO TO 1000
      ELSE IF (A.EQ.'END/')THEN
         GO TO 100
      ELSE
        GO TO 1000
      END IF
  100 CONTINUE
      CLOSE(10)
      CLOSE(20)
      STOP 100
      END

@BK2,E
```

Figure I-3. N7BJII.READ
(page 3 of 3 pages)

```
@ . N7BJII.MODP
@ : DATA IS N7FULL.0327158
@PACK N7BJII.
@FREE         N7PRTA.
@DELETE       N7PRTA.
@CAT,P        N7PRTA,F50
@ASG,A        N7PRTA.
@KEEP N7PRTA.
@BRKPT        PRINT$/N7PRTA
@HDG,U        THIS PRINT-OUT IS UNCLASSIFIED
@ASG,A        N7BJII.
@PRT,S N7BJII.MODP
@LIB$*BMDP82.P2T
/BMDP2T
/PROBLEM      TITLE IS '0327158 TONNAGE BOX JENKINS FORECASTS FY86'.
/INPUT        VARIABLES ARE 3.
              FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE     NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
              ADD = 2.
/TRANSFORM    TRANS = TONNAGE/1000.
              TRANSLN=LN(TONNAGE).
/END
@ADD,P N7FULL.0327158
/END
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              ARORDERS ARE '(1),(12)'./
ESTIMATION    RESIDUAL = RES./
ACF           VARIABLE IS RES./
FORECAST      CASES=13.
              START=84./
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              MAORDERS ARE '(1),(12)'./
ESTIMATION    RESIDUAL = RES./
ACF           VARIABLE IS RES./
FORECAST      CASES=13.
              START=84./
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              MAORDERS ARE '(1),(12)'.
              ARORDERS ARE '(1)'./
ESTIMATION    RESIDUAL = RES./
ACF           VARIABLE IS RES./
FORECAST      CASES=13.
              START=84./
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              ARORDERS ARE '(1,2)'.
              MAORDERS ARE '(1),(12)'./
ESTIMATION    RESIDUAL = RES./
ACF           VARIABLE IS RES./
FORECAST      CASES=13.
              START=84./
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              ARORDERS ARE '(1,2,3)'.
              MAORDERS ARE '(1),(12)'./
ESTIMATION    RESIDUAL = RES./
ACF           VARIABLE IS RES./
FORECAST      CASES=13.
              START=84./
ARIMA         VAR = TRANS.
              DFORDER ARE 1,12.
              MAORDERS ARE '(1),(12)'.
```

Figure I-4. N7BJII.MODP
(page 1 of 3 pages)

```
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            ARORDERS ARE '(1),(12)'.
            MAORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1,6),(12)'.
            ARORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            ARORDERS ARE '(1,6),(12)'.
            MAORDERS ARE '(1),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1,6),(12)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            ARORDERS ARE '(1),(12)'.
            MAORDERS ARE '(1)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            ARORDERS ARE '(1),(12)'.
            MAORDERS ARE '(1,6)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1),(12)'.
            ARORDERS ARE '(1,6)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            MAORDERS ARE '(1),(12)'.
            ARORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1,12.
            ARORDERS ARE '(1),(12)'.
            MAORDERS ARE '(1,2)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            ARORDERS ARE '(1)'.
            MAORDERS ARE '(6)'./
ESTIMATION  RESIDUAL = RES./
ACF         VARIABLE IS RES./
FORECAST    CASES=13.
            START=84./
ARIMA       VAR = TRANS.
            DFORDER ARE 1.
            MAORDERS ARE '(1)'.
```

Figure I-4. N7BJII.MODP
(page 2 of 3 pages)

```
                         ARORDERS ARE '(1,2)'./
          ESTIMATION     RESIDUAL = RES./
          ACF            VARIABLE IS RES./
          FORECAST       CASES=13.
                         START=84./
          ARIMA          VAR = TRANS.
                         DFORDER ARE 1.
                         ARORDERS ARE '(2)'.
                         MAORDERS ARE '(1)'./
          ESTIMATION     RESIDUAL = RES./
          ACF            VARIABLE IS RES./
          FORECAST       CASES=13.
                         START=84./
          ARIMA          VAR = TRANS.
                         DFORDER ARE 1.
                         ARORDERS ARE '(1,2)'.
                         MAORDERS ARE '(3)'./
          ESTIMATION     RESIDUAL = RES./
          ACF            VARIABLE IS RES./
          FORECAST       CASES=13.
                         START=84./
          ARIMA          VAR = TRANS.
                         DFORDER ARE 1,12.
                         ARORDERS ARE '(1)'.
                         MAORDERS ARE '(1)'./
          ESTIMATION     RESIDUAL = RES./
          ACF            VARIABLE IS RES./
          FORECAST       CASES=13.
                         START=84./
          END/
          @BRKPT         PRINT$
          @SYM,U         N7PRTA,1,PR
          @BK1 U
          @PRT,S N7BJII.MODP
          @USE 10.,N7PRTA.
          @XQT N7BJII.B81SYMABS
          R
          0327158
          @BK2,E
```

Figure I-4. N7BJII.MODP
(page 3 of 3 pages)

```
@ . N7BJII.FORP       FROM N7BJ.P2TFUFOR
@ . DATA IS N7FULL.021783B
@PACK N7BJII.
@FREE         N7PRTB.
@DELETE       N7PRTB.
@CAT,P        N7PRTB,F50
@ASG,A        N7PRTB.
@KEEP N7PRTB.
@BRKPT        PRINT$/N7PRTB
@HDG,U        THIS PRINT-OUT IS UNCLASSIFIED
@ASG,A        N7BJII.
@PRT,S N7BJII.FORP
@LIB$*BMDPB2.P1T
/BMDP1T
/PROBLEM      TITLE IS '021780B BOX JENKINS FORECASTS FY86'.
/INPUT        VARIABLES ARE 3.
              FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE     NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
              ADD = 2.
/TRANSFORM TRANS = TONNAGE/1000.
              TRANSLN=LN(TONNAGE).
/END
@ADD,P        N7FULL.021780B
/END
 SNAPSHOT     VARIABLE IS TRANS.
              SPAN = 3.
              PRINT./
 SNAPSHOT     VARIABLE IS TRANS.
              SPAN = 6.
              PRINT./
 SNAPSHOT     VARIABLE IS TRANS.
              SPAN = 12.
              PRINT./
END/
@LIB$*BMDPB2.P2T
/BMDP2T
/PROBLEM      TITLE IS '021780B BOX JENKINS FORECASTS FY85'.
/INPUT        VARIABLE IS 3.
              FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE     NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
              ADD = 2.
/TRANSFORM TRANS = TONNAGE/1000.
              TRANSLN = LN(TONNAGE).
/END
@ADD,P N7FULL.021780B
/END
TPLOT         VARIABLE IS TONNAGE.
              SYMBOLS ARE O,N,D,J,F,M,A,M,J,J,A,S./
ACF           VARIABLE IS TONNAGE./
PACF          VARIABLE IS TONNAGE./
DIFFERENCE OLD = TRANS.
              NEW = TRANSDF.
              DFORDER=1,12./
TPLOT         VARIABLE IS TRANSDF./
ACF           VARIABLE IS TRANS.
              DFORDER=1,12./
PACF          VARIABLE IS TRANS.
              DFORDER=1,12./
END/
@LIB$*BMDPB2.P2T
/BMDP2T
/PROBLEM      TITLE IS '021780B BOX JENKINS FORECASTS FY86'.
/INPUT        VARIABLES ARE 3.
              FORMAT IS '(1X,F2.0,F2.0,F10.2)'.
/VARIABLE     NAMES ARE SAILYR,MONTH,TONNAGE,TRANS,TRANSLN.
              ADD = 2.
/TRANSFORM TRANS = TONNAGE/1000.
              TRANSLN=LN(TONNAGE).
/END
@ADD,P N7FULL.021780B
/END
ARIMA         VAR = TRANS.
```

Figure I-5. N7BJII.FORP
(page 1 of 2 pages)

```
                     DFORDER=1.
                     MAORDERS ARE '(1)'./
ESTIMATION           RESIDUAL = RES./
PRINT                VAR=TONNAGE,TRANS,TRANSLN,RES./
ACF                  VARIABLE IS RES./
FORECAST             CASES = 25.
                     START = 72./
END/
@BRKPT               PRINT$
@SYM,J               N7PRTB,1,PR
@BK1 U
@PRT,S N7BJII.FORP
@ASG,A N7SHORT.
@ASG,A N7MTMK.
@ASG,T N720.
@ED,I N7SHORT.0217808
@ED,I N7MTMK.021780B
@USE 10.,N7PRTB.
@USE 20.,N720.
@XQT N7BJII.3B1SYMABS
W
021780B TONNAGE/1000 BOX-JENKINS FORECASTS FY86
@ED,R N7FULL.021780B
LNP
@COPY,I 20.,N7SHORT.021780B
@ED,R N7SHORT.0217808
P!
@COPY,I N7PRTB.,N7MTMK.0217808
@BK2,E
```

Figure I-5. N7BJII.FORP
(page 2 of 2 pages)

f. Data Inputs. The format of the input data, read by the BMDP package driven by each of the previous five runstreams, is identical. The input consists of the year, the month, and the number of tons shipped during that month for a possible 84 months (Oct 77 through Sep 84). For the time series with route identifications of 0117 and 1701, the format of the input data was (2x, F3.0, F3.0, 2x, F11.2). For the remaining time series the format of the data was (1x, F2.0, F2.0, F10.2). Near the beginning of each of these runstreams the BMDP package was instructed to scale the data by a factor of 1/1,000, so that later in the runstream, the data would not exceed the format specifications of some of the BMDP subroutines. Because of this, much of the output from these runstreams is in thousands of tons.

g. Files Containing Results

(1) The record of the results of the analysis performed on each individual time series is contained in two files, N7MTMK and N7SHORT. In both cases the individual elements of these files are the individual route-commodity-mode combinations. The format of the element identification is .XXYYZZA,

where:

xx = point of embarkation (two integers)
yy = point of debarkation (two integers)
zz = commodity code (two integers)
a = mode (B = breakbulk, C = container, M = MILVAN)

EG. N7MTMK.011760 C

01 = embarkation point
17 = debarkation point
60 = commodity
C = container

(2) Each of the elements in the file N7MTMK. contains the full output produced by BJII.FORP, a listing of the original observations expressed in tons, thousands of tons, natural logs of tons, and a listing of the residual between the original observations (in thousands of tons) and the corresponding expected values. Elements in the file N7SHORT. contain only the estimates that define the model, the associated test statistics, the listings of the original observations, the transformations, the residuals, and finally the forecasts. Appendix H contains some of each of the elements of N7SHORT.

APPENDIX J

INTEGRATION SOFTWARE

J-1. GENERAL. This appendix briefly describes two routines: Box-Jenkins root mean square (RMS) routine (Figure J-1) and Forecast Merge routine (Figure J-3).

J-2. BOX-JENKINS (RMS). This program uses as input a file composed of elements from N7SHORT (BMDP runs of Box-Jenkins forecasts). The program reads the route-commodity-mode combination from the first line of the file. It then searches the rest of the file for special characters which indicate the number of data values, the type of transformation used in the forecast, and where the data and residuals are listed. The residuals are the differences between the observed and predicted values. From these residuals, the RMS error is calculated. Then, the route-commodity-mode combination and the associated RMS value are printed. If the forecast is based upon a logarithmic transformation of the data, a "$" is printed in the first column of the output line. The forecast is then printed, and the routine searches for the next route-commodity-mode combination. The output file is labeled G4TWFI.BJ/OUT and is reproduced here as Figure J-2. This file is saved for later processing by the Merge routine.

J-3. FORECAST MERGE ROUTINE. This program is a merge routine. It uses three files as input: G4TWFIMAN (Manual Entry file), G4TWFIWINDAT (Winters Forecast file), and G4TWFI.BJ/OUT (Box-Jenkins RMS Routine Output file). The routine reads both the Manual file and Box-Jenkins file into arrays. Then, each Winters forecast is read in, one at a time, and compared to the manual and Box-Jenkins arrays. The final forecast for each route-commodity-mode combination is chosen using the following criteria:

a. Manual entries automatically are chosen.

b. If no manual entry is present, but a logarithmically-transformed Box-Jenkins forecast exists, the Box-Jenkins is chosen.

c. If neither a or b occurs, the RMS values are compared, and the method with the lower RMS is chosen.

The selected forecasts are then printed, both to tape and G4MERGEDATA, which is shown here as Figure J-4.

```
      IMPLICIT INTEGER (A-Z)
      CHARACTER MODE*1,COMM*2,CH*1
      REAL RES,SUM,RMS,FYNEW(12)
C
      WRITE(6,101)
  101 FORMAT(' INPUT NUMBER OF B-J IN ADD FILE:')
      READ(5,*)J
      WRITE(6,160)J
  160 FORMAT(' # OF BOX-JENKINS=',I3)
      DO 500 L=1,J
      WRITE(6,666)L
  666 FORMAT(' CASE #:',I3)
      READ(10,103)POE,POD,COMM,MODE
      WRITE(6,100)POE,POD,COMM,MODE
  100 FORMAT(1X,I2,I2,A2,A1)
  103 FORMAT(I2,I2,A2,A1)
    8 READ(10,115)CH
      IF(CH.NE.'=')GOTO 8
      READ(0,120)N
  115 FORMAT(2X,A1)
  120 FORMAT(5X,I3)
      WRITE(6,125)N
  125 FORMAT(' N=',I4)
   10 READ(10,110)CH
      IF(CH.NE.'-')GOTO 10
  110 FORMAT(1X,A1)
      FLAG=0
      READ(10,110)CH
      IF(CH.EQ.'L')FLAG=1
      READ(10,107)
107   FORMAT(/////////////)
      DO.200 I=14,N
      READ(10,130)RES
  130 FORMAT(43X,F6.4)
      SUM=SUM+RES*RES
  200 CONTINUE
      RMS=SQRT(SUM/(FLOAT(N)-13.0))*1000.
  210 READ(10,110)CH
      IF(CH.NE.'F')GOTO 210
      DO 250 I=1,12
      IF(FLAG.EQ.0) THEN
      READ(10,135)FYNEW(I)
      ELSE
      READ(10,136)FYNEW(I)
  136 FORMAT(47X,F8.5)
      ENDIF
      IF(FYNEW(I).LT.0.0)FYNEW(I)=0.00
      FYNEW(I)=FYNEW(I)*1000.
  135 FORMAT(17X,F8.5)
  250 CONTINUE
  260 READ(10,110)CH
      IF(CH.NE.'S')GOTO 260
      IF(FLAG.EQ.1) THEN
      CH='$'
      ELSE
      CH=' '
      ENDIF
      WRITE(12,400)CH,POE,POD,COMM,MODE,RMS
      WRITE(12,410)(FYNEW(I),I=1,12)
      WRITE(6,410)(FYNEW(I),I=1,12)
  400 FORMAT(A1,I2,I2,1X,A2,A1,1X,F10.2)
  410 FORMAT(6F10.2/6F10.2)
      SUM=0.0
  500 CONTINUE
      STOP
      DEBUG SUBCHK
      END
```

Figure J-1. Box-Jenkins RMS Routine

1:	117 11C	138.87				
2:	51.21	42.15	16.50	39.45	13.57	37.46
3:	371.26	566.91	416.78	773.81	751.37	653.60
4:	117 15C	350.50				
5:	1413.80	1584.66	1464.49	1628.46	1273.70	1657.26
6:	1776.88	2210.84	1812.59	1990.35	1359.81	1087.95
7:$	117 30B	1367.15				
8:	2500.64	6961.57	6223.51	4416.22	2951.95	3642.48
9:	1906.99	2765.32	9064.94	5910.05	666.69	1915.91
10:	117 30C	3677.63				
11:	8538.09	5423.81	5153.71	5165.36	7168.85	8560.71
12:	7456.00	6708.25	6426.16	9691.52	14891.16	11871.91
13:	117 40B	3320.28				
14:	2878.97	2839.19	3287.82	3352.10	3067.83	3242.35
15:	3264.60	3156.04	3223.90	3231.51	3190.06	3216.44
16:$	117 40C	835.63				
17:	181.06	186.25	184.60	185.12	184.95	185.00
18:	184.99	184.99	184.99	184.99	184.99	184.99
19:	117 40M	1448.20				
20:	4599.47	4439.08	4042.64	4617.64	4595.70	4635.38
21:	4605.93	4613.48	4533.59	4642.18	4480.13	4413.76
22:	117 60B	1024.07				
23:	1427.66	2282.24	1876.85	2460.93	2028.97	2184.66
24:	2069.52	2111.02	2080.33	2091.39	2083.21	2086.16
25:	117 60C	4442.44				
26:	87836.16	85282.88	82924.70	77643.12	78189.96	93925.82
27:	95720.38	745.57	92955.53	93696.55	95476.77	85759.99
28:	117 60M	209.96				
29:	320.67	293.58	401.10	432.90	413.62	415.33
30:	409.13	475.84	596.55	517.10	489.93	371.55
31:	117 61C	704.03				
32:	803.80	710.07	660.46	988.60	802.49	581.08
33:	391.22	528.47	558.58	710.67	880.57	718.84
34:	117 66B	524.60				
35:	200.73	47.88	136.54	.00	.00	3.75
36:	.00	.00	.00	435.89	.00	217.97
37:	117 66C	175.45				
38:	493.38	440.07	429.94	499.63	563.49	493.42
39:	515.61	417.11	489.30	518.73	430.19	473.75
40:	117 80B	4331.44				
41:	25763.71	25556.37	26217.51	16940.05	15305.45	24105.83
42:	25681.55	29403.82	23614.07	21976.46	20557.28	30061.14
43:	117 80C	163.20				
44:	296.34	273.16	315.22	326.03	345.42	357.04
45:	274.83	469.56	318.82	377.98	555.33	371.34
46:	350 11C	42.82				
47:	96.67	97.19	85.49	94.79	89.13	81.31
48:	72.10	100.66	81.82	69.17	92.03	88.07
49:	350 15C	57.85				
50:	150.54	150.54	150.54	150.54	150.54	150.54
51:	150.54	150.54	150.54	150.54	150.54	150.54
52:	350 30C	10.27				
53:	.00	19.86	19.03	17.23	9.77	12.04
54:	7.13	11.96	29.20	17.00	21.14	6.40
55:	350 60B	60.76				
56:	128.68	102.30	189.64	109.47	97.44	84.67
57:	94.54	105.91	72.06	92.93	88.28	148.24
58:	350 60C	957.40				
59:	4493.12	4105.53	3905.51	2966.27	3661.03	4960.79
60:	3476.30	5387.46	4856.85	6295.78	4938.30	5428.91
61:	350 61C	34.76				
62:	10.23	36.74	.00	.00	6.48	.00
63:	16.09	2.73	39.50	61.48	28.90	19.11
64:	350 80B	45.98				
65:	47.07	44.07	94.28	40.75	36.20	59.22
66:	60.98	36.20	47.74	72.53	177.35	62.22
67:	351 11C	136.63				
68:	193.12	164.28	256.65	287.98	286.91	415.77
69:	292.62	376.79	194.11	400.95	288.98	291.51
70:	351 15C	136.37				
71:	340.13	406.81	375.21	336.34	357.18	348.11
72:	352.06	350.34	351.09	350.76	350.90	350.84
73:	351 30C	126.98				
74:	332.21	265.08	306.17	366.59	309.94	330.22
75:	418.04	304.58	447.24	569.36	581.00	367.65
76:	351 40B	3640.19				
77:	2298.42	2298.42	2298.42	2298.42	2298.42	2298.42
78:	2298.42	2298.42	2298.42	2298.42	2298.42	2298.42
79:	351 40C	28.81				
80:	19.33	5.90	5.23	18.24	6.86	2.39
81:	6.09	3.04	.00	5.92	2.24	8.30
82:	351 60B	440.48				

Figure J-2. Box-Jenkins RMS Routine Output File
(page 1 of 3 pages)

83:	895.66	399.06	417.29	524.46	380.16	442.02
84:	749.35	575.89	400.43	609.13	682.56	530.26
85:	351 60C	2613.57				
86:	12440.49	14193.78	12153.11	12162.78	11996.29	15024.43
87:	16590.32	16610.13	16080.14	14162.26	12908.56	14348.92
88:	351 61C	145.13				
89:	29.81	49.83	30.58	42.89	5.01	49.00
90:	3.52	85.70	237.28	240.23	178.48	150.57
91:	351 66C	30.44				
92:	17.08	8.22	3.92	6.18	1.67	3.59
93:	2.09	6.91	32.91	2.60	32.08	4.07
94:	351 80B	440.48				
95:	895.66	399.06	417.29	524.46	380.16	442.02
96:	749.35	575.89	400.43	609.13	682.56	530.26
97:	351 80C	180.21				
98:	421.59	137.50	169.96	182.16	128.35	302.79
99:	169.75	138.81	204.29	245.31	529.51	370.19
100:	425 11C	37.86				
101:	89.52	89.52	89.52	89.52	89.52	89.52
102:	89.52	89.52	89.52	89.52	89.52	89.52
103:	425 15C	14.40				
104:	33.10	12.53	38.96	31.39	2.64	58.98
105:	39.09	19.22	47.54	32.05	14.66	51.90
106:	425 30C	336.08				
107:	840.43	983.96	648.53	675.28	767.54	1003.11
108:	574.20	735.62	1046.73	451.54	815.71	692.91
109:	425 40C	2.33				
110:	.76	.76	.76	.76	.76	.76
111:	.76	.76	.76	.76	.76	.76
112:	425 60C	979.64				
113:	3694.65	4107.99	4273.85	3464.37	4384.49	5048.36
114:	5480.02	5709.62	5091.41	5026.42	5707.85	4986.15
115:	425 61C	92.18				
116:	203.46	179.27	181.96	183.06	188.84	189.54
117:	187.04	193.00	192.34	192.07	190.64	190.47
118:	425 80C	230.45				
119:	188.30	139.01	79.50	.00	.00	148.56
120:	44.53	133.33	230.05	.00	266.26	84.44
121:	517 1 30B	285.06				
122:	6284.49	9011.17	7001.08	6494.69	5341.60	7669.06
123:	9342.88	12130.64	16119.10	11424.44	9649.29	7523.15
124:	17 1 30C	1040.45				
125:	3008.36	2514.25	2460.05	2417.42	2513.94	2671.06
126:	2748.38	3921.38	4018.37	4452.38	3743.77	3587.17
127:	17 1 60B	256.71				
128:	262.50	376.25	405.09	274.08	428.87	317.18
129:	391.51	217.05	347.25	282.09	330.71	321.16
130:	17 1 60M	708.93				
131:	1863.52	2352.81	2017.01	1021.35	1802.64	1276.58
132:	1567.24	1402.42	1511.53	2100.96	2362.82	1404.81
133:	17 1 61B	860.67				
134:	1770.57	1196.63	1817.01	1236.15	1240.14	2013.13
135:	1311.77	1515.13	2640.95	3334.54	3151.41	2634.83
136:	17 1 61C	237.42				
137:	600.55	886.20	547.33	587.91	572.72	524.47
138:	293.91	416.61	550.58	738.76	520.20	381.39
139:	17 1 66B	3111.86				
140:	2938.63	2527.61	4506.65	4682.61	1101.03	5271.94
141:	5768.69	9303.82	4715.50	2582.33	2641.50	5606.63
142:	17 1 80B	2220.49				
143:	7591.82	232.81	1468.57	737.05	791.98	314.61
144:	671.81	561.89	808.79	645.85	543.13	412.97
145:	327 11B	12.08				
146:	26.79	11.85	46.58	50.50	6.34	5.88
147:	.94	4.60	6.19	34.92	15.58	42.22
148:	327 15B	20.83				
149:	83.86	68.99	78.19	68.66	80.12	90.79
150:	82.50	86.15	103.99	106.27	95.10	86.82
151:	327 15C	17.19				
152:	10.76	7.75	26.54	14.81	17.31	23.08
153:	9.24	22.98	19.18	33.47	9.44	26.84
154:	327 30B	470.99				
155:	1916.75	1726.93	1993.50	2029.50	1898.74	1817.37
156:	1595.32	2117.49	2703.18	3156.29	3118.40	2454.87
157:	327 30C	8.91				
158:	7.45	7.04	8.48	2.95	6.86	6.08
159:	2.51	.00	3.31	3.83	10.72	.00
160:	327 40C	21.57				
161:	.00	.00	.00	.00	.00	.00
162:	.00	.00	.00	.00	.27	.00
163:	327 60B	85.01				
164:	65.89	69.70	32.59	77.80	49.75	89.41

Figure J-2. Box-Jenkins RMS Routine Output File
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165:	124.99	113.83	65.56	80.74	76.46	220.05
166:	327 60C	877.31				
167:	6115.41	6530.23	6145.23	5376.47	6137.68	7132.12
168:	7105.75	7413.13	7693.47	7267.38	7533.07	7281.40
169:	327 61C	74.83				
170:	109.05	87.12	59.49	50.82	78.62	79.89
171:	70.08	30.57	54.53	58.61	195.82	99.92
172:	327 66C	1.82				
173:	3.74	1.39	.88	1.74	1.97	2.96
174:	2.97	2.47	2.21	2.86	4.59	2.81
175:	327 80C	14.52				
176:	.00	7.37	5.91	12.00	7.19	7.21
177:	5.99	25.74	2.08	1.52	3.79	4.51
178:	217 60B	771.05				
179:	117.50	877.82	1068.99	1014.30	837.47	451.72
180:	419.14	998.02	665.89	709.28	3980.12	1990.21
181:	217 61C	178.59				
182:	378.63	378.63	378.63	378.63	378.63	378.63
183:	378.63	378.63	378.63	378.63	378.63	378.63
184:	217 60C	1013.80				
185:	3801.84	3801.84	3801.84	3801.84	3801.84	3801.84
186:	3801.84	3801.84	3801.84	3801.84	3801.84	3801.84
187:	2727 80B	3141.70				
188:	.00	.00	.00	.00	.00	.00
189:	1026.81	786.68	.00	3848.27	6699.12	947.11
190:	2727 60B	165.93				
191:	472.37	494.63	315.47	386.40	364.84	418.95
192:	383.29	668.11	557.49	714.12	742.18	634.83
193:	2727 40B	35.04				
194:	60.08	98.33	22.89	12.98	108.30	15.49
195:	20.28	25.33	23.80	163.12	20.43	40.37
196:	2727 30B	30.26				
197:	58.66	55.84	38.68	53.03	45.39	41.91
198:	44.30	16.73	50.34	46.00	56.01	51.19
199:	2727 61B	9.11				
200:	6.42	6.42	6.42	6.42	6.42	6.42
201:	6.42	6.42	6.42	6.42	6.42	6.42
202:	118 30C	34.01				
203:	68.75	31.36	40.17	55.76	22.50	51.23
204:	44.62	58.35	124.00	117.30	105.96	58.17

Figure J-2. Box-Jenkins RMS Routine Output File
(page 3 of 3 pages)

```
C    MERGE ROUTINE FOR MTMC TAPE
C    WRITTEN BY:   THOMAS JOHNSON
C                  DAN LUNDY
C    DATE:         2/27/85
C    FILE REFERENCES:
C          10=  WINTERS FILE
C          11=  B-J FLE
C          12=  MANUAL FILE
C          13=  OUTPUT FILE
C
        IMPLICIT INTEGER (A-Z)
        INTEGER FY,FSIX,LSIX,FLAG,NUM(30,2),SUM,NUM1,NUM2,FLAG1
C
        CHARACTER CH*1(100),CHR*1,STR*8(100),WSTR*8,LASTR*8,MCOM*3(100),
       *MSTRR*4(30)
        CHARACTER*1 ACODE
        CHARACTER*2 CTYPES(12),CMDCDE*3(12)
C
        REAL RMS(100),FYBJ(100,12),FYUSE(12),WRMS,FYMAN(100,12)
C
        DATA CTYPES / '11','15','20','22','30','40','60','61','66','70',
       *              '80','90' /
        DATA CMDCDE / 'CHL','FRZ','BLK','COK','POV','AMO','GEN',
       *              'HHG','CNX','CCT','SPC','AAC' /
        DATA ACODE / 'A' /
        DATA FY, FSIX, LSIX / 86, 10, 4 /
C
        OPEN(13,ERR=490,STATUS='NEW',FORM='FORMATTED',RFORM='F',
       *     MRECL=80,TYPE='ANSI',BLOCK=80)
C
        FLAG=0
        FLAG1=0
        IVAL2=0
        DO 675 I=1,30
          NUM(I,1)=0
          NUM(I,2)=0
675     CONTINUE
        NUM1=0
        NUM2=0
        WRITE(6,100)
    100 FORMAT(' INPUT # OF B-J RUNS IN FILE (<=100 PLS):')
        READ(5,*)J
        WRITE(6,89)
89      FORMAT(' INPUT # OF ROUTES IN MANUAL FILE (<=100 PLS):')
        READ(5,*) R
        DO 300 I=1,J
        READ(11,110)CH(I),STR(I),RMS(I)
        READ(11,115)(FYBJ(I,K),K=1,12)
        IF(STR(I)(1:1).EQ.' ')STR(I)(1:1)='0'
        IF(STR(I)(3:3).EQ.' ')STR(I)(3:3)='0'
    110 FORMAT(A1,A8,1X,F10.2)
    115 FORMAT(6F10.2/6F10.2)
    300 CONTINUE
        NUM1=0
        DO 102 I=1,R
          READ(12,10,END=351)MSTRR(I),NUM(I,1)
351       NUM1=NUM1+NUM(I,1)
10        FORMAT(1X,A4,1X,I1)
          DO 103 L=NUM1-NUM(I,1)+1,NUM1
            READ(12,11) MCOM(L)
11          FORMAT(1X,A3)
            READ(12,12,END=304) (FYMAN(L,N),N=1,12)
12          FORMAT(5X,F10.2)
103       CONTINUL
102     CONTINUE
304     READ(10,120,END=500)WSTR,WRMS
    305 LASTR=WSTR
        DO 106 I=1,R
          IF (WSTR(1:4) .EQ. MSTRR(I)) THEN
            IVAL1=I
          GOTO 109
          END IF
106     CONTINUE
        GOTO 539
109     SUM=0
        DO 107 I=1,IVAL1-1
          SUM=SUM+NUM(I,1)
107     CONTINUE
        DO 108 I=SUM+1,SUM+NUM(IVAL1,1)
          IF(WSTR(6:8) .EQ. MCOM(I)) THEN
            READ(10,135,END=500) WSTR,WRMS
```

Figure J-3. Forecast Merge Routine
(page 1 of 3 pages)

```
          GOTO 169
         END IF
108     CONTINUE
  120   FORMAT(1X,A8,1X,F10.2)
539     DO 350 I=1,J
        IF(STR(I).EQ.WSTR) THEN
        IVAL=I
        GOTO 360
        ENDIF
   350  CONTINUE
   355  DO 357 P=1,12
        READ(10,215,END=500) FYUSE(P)
   215  FORMAT(F10.2)
   357  CONTINUE
        CHR='W'
        GOTO 600
   360  IF(RMS(IVAL).GT.WRMS.AND.CH(IVAL).NE.'S')GOTO 355
        CHR='B'
        DO 365 I=1,12
        FYUSE(I)=FYBJ(IVAL,I)
   365  CONTINUE
   600  WRITE(6,125)CHR,WSTR
   125  FORMAT(' ',A1,1X,A8)
        WRITE(6,115)(FYUSE(I),I=1,12)
C
        DO 127 S = 1,12
           IF(WSTR(6:7) .EQ. CTYPES(S)) T = S
127     CONTINUE
        WRITE(13,130) ACODE,CMDCDE(T),FY,WSTR(1:4),ACODE,FSIX,
     *        WSTR(8:8),(NINT(FYUSE(I)), I=1,6)
        WRITE(13,130) ACODE,CMDCDE(T),FY,WSTR(1:4),ACODE,LSIX,
     *        WSTR(8:8),(NINT(FYUSE(I)), I=7,12)
130     FORMAT(A1,4X,A3,I2,A4,A1,1X,I2,A1,6I6,25X)
        WRITE(17,130) ACODE,CMDCDE(T),FY,WSTR(1:4),ACODE,FSIX,
     *        WSTR(8:8),(NINT(FYUSE(I)), I=1,6)
        WRITE(17,130) ACODE,CMDCDE(T),FY,WSTR(1:4),ACODE,LSIX,
     *        WSTR(8:8),(NINT(FYUSE(I)), I=7,12)
C
        IF(CHR.EQ.'B') THEN
        READ(10,135,END=500)WSTR,WRMS
   135  FORMAT(/////////////1X,A8,1X,F10.2)
        ELSE
        READ(10,120,END=500)WSTR,WRMS
        ENDIF
169     IF(WSTR(1:4).NE.LASTR(1:4)) THEN
           DO 429 I=1,R
             IF(LASTR(I:4) .EQ. MSTRR(I)) THEN
               IVAL1=I
               NUM(I,2)=1
               GOTO 431
             END IF
429        CONTINUE
           NUM2=0
           GOTO 805
431        NUM2=NUM(IVAL1,1)
432        SUM=0
           DO 433 I=1,IVAL1-1
             SUM=SUM+NUM(I,1)
433        CONTINUE
805     WRITE(6,810)NUM2
        IF (NUM2 .EQ. 0) GOTO 712
  810   FORMAT(' NUMBER OF MANUAL ENTRIES=',I3)
  140   FORMAT(1X,A4,1X,I1)
792     CHR='M'
        DO 712 I=1,NUM(IVAL1,I)
        DO 890 K=1,12
           FYUSE(K)=FYMAN(SUM+I,K)
890     CONTINUE
        IF (FLAG .EQ. 1) THEN
           LASTR=MSTRR(IVAL2)//MCOM(L)
           GOTO 473
        END IF
        LASTR=LASTR(1:5)//MCOM(SUM+I)
473     WRITE(6,125) CHR,LASTR
        WRITE(6,115)(FYUSE(L),L=1,12)
C
        DO 405 S = 1,12
           IF(LASTR(6:7) .EQ. CTYPES(S)) T = S
405     CONTINUE
        WRITE(13,130) ACODE,CMDCDE(T),FY,LASTR(1:4),ACODE,FSIX,
     *        LASTR(8:8),(NINT(FYUSE(JJ)), JJ=1,6)
        WRITE(13,130) ACODE,CMDCDE(T),FY,LASTR(1:4),ACODE,LSIX,
```

Figure J-3. Forecast Merge Routine
(page 2 of 3 pages)

```
     *        LASTR(8:8),(NINT(FYUSE(JJ)), JJ=7,12)
      WRITE(17,130) ACODE,CMDCDE(T),FY,LASTR(1:4),ACODE,FSIX,
     *        LASTR(8:8),(NINT(FYUSE(JJ)), JJ=1,6)
      WRITE(17,130) ACODE,CMDCDE(T),FY,LASTR(1:4),ACODE,LSIX,
     *        LASTR(8:8),(NINT(FYUSE(JJ)), JJ=7,12)
C
712   CONTINUE
      IF (FLAG1 .EQ. 1)  GOTO 500
      END IF
      GOTO 305
490   PRINT *, ' FILE 13 OPEN ERROR '
      WRITE(6,77)
77    FORMAT(' THESE ARE THE EXTRA MANUAL ENTRIES')
500   FLAG1=1
      IF(FLAG .EQ. 1) GOTO 683
      DO 679 I=IVAL2+1,R
        FLAG=0
        IF(NUM(I,2) .EQ. 0)THEN
          SUM=0
          IVAL2=I
          FLAG=1
          SUM=0
          DO 681 L=1,IVAL2-1
            SUM=SUM+NUM(L,1)
681       CONTINUE
          DO 683 L=SUM+1,SUM+NUM(IVAL2,1)
            GOTO 792
683       CONTINUE
        END IF
679   CONTINUE
      ENDFILE 13
      STOP
      END
```

Figure J-3. Forecast Merge Routine
(page 3 of 3 pages)

1:A	GEN860117A	10C	87836	85283	82925	77643	78190	93926
2:A	GEN860117A	4C	95726	746	92956	93697	95477	85760
3:A	GEN860117A	10B	2131	2181	1851	1603	1535	2176
4:A	GEN860117A	4B	1253	1828	1714	2032	876	2589
5:A	GEN860117A	10M	321	294	401	433	414	415
6:A	GEN860117A	4M	409	476	597	517	490	372
7:A	COK860117A	10B	14757	12913	2659	3562	5170	10131
8:A	COK860117A	4B	8962	7404	15632	7078	14588	7201
9:A	SPC860117A	10B	25764	25556	26218	16940	15305	24106
10:A	SPC860117A	4B	25682	29404	23614	21976	20557	30061
11:A	SPC860117A	10C	296	273	315	326	345	357
12:A	SPC860117A	4C	275	470	319	378	555	371
13:A	BLK860117A	10C	0	0	0	0	0	0
14:A	BLK860117A	4C	0	0	0	0	0	0
15:A	AMO860117A	10B	0	0	0	0	0	0
16:A	AMO860117A	4B	0	1554	393	6	77	1
17:A	AMO860117A	10M	4599	4439	4043	4618	4596	4635
18:A	AMO860117A	4M	4606	4613	4534	4642	4480	4414
19:A	AMO860117A	10C	181	186	185	185	185	185
20:A	AMO860117A	4C	185	185	185	185	185	185
21:A	FRZ860117A	10C	1414	1585	1464	1628	1274	1657
22:A	FRZ860117A	4C	1777	2211	1813	1990	1360	1088
23:A	HHG860117A	10C	651	399	460	564	485	415
24:A	HHG860117A	4C	398	413	404	542	633	537
25:A	CNX860117A	10C	493	440	430	500	563	493
26:A	CNX860117A	4C	516	417	489	519	430	474
27:A	CNX860117A	10B	201	48	137	0	0	4
28:A	CNX860117A	4B	0	0	0	436	0	218
29:A	CHL860117A	10C	51	42	17	39	14	37
30:A	CHL860117A	4C	371	567	417	774	751	654
31:A	BLK860117A	10B	0	8690	0	0	24710	24881
32:A	BLK860117A	4B	0	24451	21116	16831	20929	20984
33:A	POV860117A	10C	14829	8585	13874	13329	8468	10190
34:A	POV860117A	4C	11829	14226	13912	14011	20122	16881
35:A	POV860117A	10B	2065	1641	4395	2916	706	869
36:A	POV860117A	4B	1865	2844	2028	471	108	543
37:A	HHG860117A	10B	0	0	0	5	0	18
38:A	HHG860117A	4B	0	0	0	0	0	10
39:A	SPC860217A	10B	0	1010	757	0	0	86
40:A	SPC860217A	4B	2501	0	0	314	12503	1362
41:A	GEN860217A	10C	3766	2903	2543	3832	3630	2590
42:A	GEN860217A	4C	3364	3123	3019	3687	3532	2919
43:A	GEN860217A	10B	134	310	309	413	191	150
44:A	GEN860217A	4B	177	191	132	194	816	229
45:A	POV860217A	10C	1986	1522	1707	1877	1675	1472
46:A	POV860217A	4C	1602	1454	1660	2321	2729	2020
47:A	HHG860217A	10C	261	231	129	207	159	214
48:A	HHG860217A	4C	274	167	144	325	328	208
49:A	CNX860217A	10B	0	29	0	0	135	0
50:A	CNX860217A	4B	0	0	0	0	0	0
51:A	POV860217A	10B	0	24	882	0	272	0
52:A	POV860217A	4B	0	0	0	255	0	0
53:A	FRZ860217A	10C	0	0	0	0	0	0
54:A	FRZ860217A	4C	0	0	0	0	0	0
55:A	POV861701A	10C	3008	2514	2460	2417	2514	2671
56:A	POV861701A	4C	2748	3921	4018	4452	3744	3587
57:A	HHG861701A	10B	1100	861	1528	730	844	2056
58:A	HHG861701A	4B	803	1254	1887	1865	1854	1597
59:A	HHG861701A	10C	601	886	547	588	573	524
60:A	HHG861701A	4C	294	417	551	739	520	381
61:A	CNX861701A	10B	2939	2528	4507	4683	1101	5272
62:A	CNX861701A	4B	5769	9304	4716	2582	2642	5607
63:A	GEN861701A	10M	1864	2353	2017	1021	1803	1277
64:A	GEN861701A	4M	1567	1402	1512	2101	2363	1405
65:A	GEN861701A	10B	263	376	405	274	429	317
66:A	GEN861701A	4B	392	217	347	282	331	321
67:A	SPC861701A	10B	7592	233	1469	737	792	315
68:A	SPC861701A	4B	672	562	809	646	543	413
69:A	AMO861701A	10B	0	0	0	0	0	0
70:A	AMO861701A	4B	0	0	0	0	0	0
71:A	AMO861701A	10M	0	0	91	41	0	108
72:A	AMO861701A	4M	24	574	466	0	20	14
73:A	POV861701A	10B	0	0	0	0	0	0
74:A	POV861701A	4B	0	0	20	0	0	0
75:A	GEN861701A	10C	0	58	668	42	0	63
76:A	GEN861701A	4C	62	60	21	470	26	124
77:A	GEN860351A	10C	12440	14194	12153	12163	11996	15024
78:A	GEN860351A	4C	16590	16613	16080	14162	12909	14349
79:A	GEN860351A	10B	896	399	417	524	380	442
80:A	GEN860351A	4B	749	576	400	609	683	530
81:A	AMO860351A	10B	2298	2298	2298	2298	2298	2298
82:A	AMO860351A	4B	2298	2298	2298	2298	2298	2296

Figure J-4. Forecast Merge Routine Output
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83:A	AMO860351A	10C	0	1	3	0	0	19
84:A	AMO860351A	4C	8	9	0	0	0	0
85:A	SPC860351A	10B	896	399	417	524	380	442
86:A	SPC860351A	4B	749	576	400	609	683	530
87:A	SPC860351A	10C	132	82	178	234	68	22
88:A	SPC860351A	4C	172	93	100	117	235	231
89:A	POV860351A	10C	332	265	306	367	310	330
90:A	POV860351A	4C	418	305	447	569	581	368
91:A	FRZ860351A	10C	340	407	375	336	357	348
92:A	FRZ860351A	4C	352	350	351	351	351	351
93:A	CHL860351A	10C	166	150	208	240	263	305
94:A	CHL860351A	4C	270	239	255	307	211	226
95:A	HHG860351A	10C	30	50	31	43	5	49
96:A	HHG860351A	4C	4	86	237	240	178	151
97:A	CNX860351A	10C	17	8	4	6	2	4
98:A	CNX860351A	4C	2	7	33	3	32	4
99:A	GEN860351A	10M	0	0	0	0	0	0
100:A	GEN860351A	4M	0	0	75	0	0	0
101:A	CNX860351A	10B	0	0	0	0	0	0
102:A	CNX860351A	4B	0	0	0	0	0	20
103:A	SPC861702A	10B	10119	0	699	0	0	0
104:A	SPC861702A	4B	0	266	0	0	926	202
105:A	POV861702A	10B	1129	1542	1089	1225	698	771
106:A	POV861702A	4B	1047	1149	2000	1042	1460	1251
107:A	POV861702A	10C	359	313	271	387	161	267
108:A	POV861702A	4C	160	259	470	450	862	435
109:A	HHG861702A	10B	0	0	0	0	0	0
110:A	HHG861702A	4B	0	0	0	0	0	0
111:A	GEN861702A	10B	1974	242	0	0	76	210
112:A	GEN861702A	4B	541	0	70	360	3	258
113:A	GEN861702A	10M	297	206	513	608	631	405
114:A	GEN861702A	4M	165	461	396	96	524	181
115:A	HHG861702A	10C	369	87	5	3	46	0
116:A	HHG861702A	4C	0	39	0	0	0	0
117:A	SPC861702A	10M	0	0	0	0	0	0
118:A	SPC861702A	4M	0	0	0	0	0	2
119:A	GEN860327A	10C	5816	5317	5537	4528	5737	7212
120:A	GEN860327A	4C	7714	7881	7514	7864	8249	7494
121:A	GEN860327A	10B	45	48	9	69	9	72
122:A	GEN860327A	4B	92	87	43	86	25	79
123:A	POV860327A	10B	2013	1429	1779	1926	1939	1735
124:A	POV860327A	4B	1782	2329	2869	3474	3077	2879
125:A	POV860327A	10C	8	8	10	7	11	10
126:A	POV860327A	4C	3	4	6	4	5	2
127:A	HHG860327A	10C	121	118	83	77	93	83
128:A	HHG860327A	4C	88	60	67	76	119	96
129:A	SPC860327A	10C	0	7	6	12	7	7
130:A	SPC860327A	4C	6	26	2	2	4	5
131:A	AMO860327A	10C	0	0	0	0	0	0
132:A	AMO860327A	4C	0	0	0	0	0	0
133:A	FRZ860327A	10B	84	69	78	69	80	91
134:A	FRZ860327A	4B	83	86	104	106	95	87
135:A	FRZ860327A	10C	7	9	27	9	23	21
136:A	FRZ860327A	4C	8	19	7	27	8	39
137:A	CHL860327A	10B	18	26	29	41	11	6
138:A	CHL860327A	4B	5	8	10	19	31	30
139:A	CNX860327A	10C	4	1	1	2	2	3
140:A	CNX860327A	4C	3	2	2	3	5	3
141:A	AMO860327A	10B	0	0	0	0	0	0
142:A	AMO860327A	4B	0	200	200	200	200	200
143:A	SPC860327A	10B	34	169	0	0	22	95
144:A	SPC860327A	4B	746	2646	1870	656	253	86
145:A	CHL860327A	10C	0	0	0	0	75	75
146:A	CHL860327A	4C	75	75	75	75	75	75
147:A	GEN860425A	10C	3695	4108	4274	3464	4384	5048
148:A	GEN860425A	4C	5480	5710	5091	5026	5708	4986
149:A	HHG860425A	10C	203	179	182	183	189	190
150:A	HHG860425A	4C	187	193	192	192	191	190
151:A	CHL860425A	10C	90	90	90	90	90	90
152:A	CHL860425A	4C	90	90	90	90	90	90
153:A	FRZ860425A	10C	33	13	39	31	3	59
154:A	FRZ860425A	4C	39	19	46	32	15	52
155:A	AMO860425A	10C	0	0	1	0	1	1
156:A	AMO860425A	4C	0	0	0	0	2	0
157:A	GEN860425A	10B	0	0	0	0	0	0
158:A	GEN860425A	4B	0	40	0	0	0	0
159:A	HHG860425A	10B	0	0	0	0	0	0
160:A	HHG860425A	4B	0	0	0	0	0	10
161:A	SPC860425A	10B	659	318	141	188	192	501
162:A	SPC860425A	4B	205	255	190	164	498	191
163:A	SPC860425A	10C	25	25	25	25	25	25
164:A	SPC860425A	4C	25	25	25	25	25	25

Figure J-4. Forecast Merge Routine Output
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165:A	POV860425A	10B	1171	934	867	912	1145	1162
166:A	POV860425A	4B	1252	1083	1269	1730	1371	1061
167:A	POV860425A	10C	18	8	36	0	0	25
168:A	POV860425A	4C	14	30	0	697	886	852
169:A	GEN860118A	10C	6231	6269	5492	5696	5961	6560
170:A	GEN860118A	4C	5805	6450	6514	6977	7727	6892
171:A	POV860118A	10C	69	31	40	56	23	51
172:A	POV860118A	4C	45	58	124	117	106	58
173:A	SPC860118A	10C	5	0	0	0	0	0
174:A	SPC860118A	4C	23	0	0	0	0	6
175:A	HHG860118A	10C	24	6	7	5	11	11
176:A	HHG860118A	4C	14	4	17	16	11	7
177:A	CNX860118A	10C	7	6	1	8	1	4
178:A	CNX860118A	4C	0	2	50	11	8	13
179:A	AMO860118A	10C	0	0	0	0	0	0
180:A	AMO860118A	4C	20	0	35	0	0	0
181:A	GEN860118A	10B	0	0	0	0	0	0
182:A	GEN860118A	4B	0	0	0	0	0	30
183:A	FRZ860118A	10C	0	0	0	0	0	0
184:A	FRZ860118A	4C	30	0	0	0	0	0
185:A	SPC860118A	10B	0	0	0	0	0	0
186:A	SPC860118A	4B	0	0	0	0	0	10
187:A	GEN860350A	10C	4493	4106	3906	2966	3661	4961
188:A	GEN860350A	4C	3476	5387	4857	6296	4938	5429
189:A	GEN860350A	10B	129	102	190	109	97	85
190:A	GEN860350A	4B	95	106	72	93	88	148
191:A	FRZ860350A	10C	158	133	143	146	144	160
192:A	FRZ860350A	4C	195	143	178	173	163	204
193:A	CHL860350A	10C	90	71	103	82	91	82
194:A	CHL860350A	4C	103	69	77	101	80	97
195:A	SPC860350A	10B	47	44	94	41	36	59
196:A	SPC860350A	4B	61	36	48	73	177	62
197:A	HHG860350A	10C	10	37	0	0	6	0
198:A	HHG860350A	4C	16	3	40	61	29	19
199:A	POV860350A	10C	0	20	19	17	10	12
200:A	POV860350A	4C	7	12	29	17	21	6
201:A	SPC860350A	10C	35	0	0	0	0	0
202:A	SPC860350A	4C	0	0	0	0	0	0
203:A	SPC862727A	10B	0	0	0	0	0	0
204:A	SPC862727A	4B	1027	787	0	3848	6699	947
205:A	GEN862727A	10B	364	341	259	212	326	291
206:A	GEN862727A	4B	246	670	610	601	744	579
207:A	POV862727A	10B	59	56	39	53	45	42
208:A	POV862727A	4B	44	17	50	46	56	51
209:A	AMO862727A	10B	46	50	25	23	58	25
210:A	AMO862727A	4B	31	35	29	112	36	62
211:A	HHG862727A	10B	2	0	4	1	2	0
212:A	HHG862727A	4B	6	1	1	8	5	19
213:A	CCT862727A	10B	195	0	0	0	0	0
214:A	CCT862727A	4B	0	297	0	0	143	30
215:A	CNX862727A	10B	0	0	0	0	0	0
216:A	CNX862727A	4B	0	0	0	0	36	0
217:A	CCT861817A	10B	4757	4514	4204	3353	3296	4486
218:A	CCT861817A	4B	3824	4340	4549	4248	4964	4604
219:A	SPC861817A	10B	0	0	0	0	0	0
220:A	SPC861817A	4B	0	0	0	0	0	0
221:A	GEN861817A	10C	125	103	109	160	141	40
222:A	GEN861817A	4C	45	197	66	440	89	202
223:A	GEN861817A	10B	0	0	0	0	0	0
224:A	GEN861817A	4B	0	0	0	0	0	0
225:A	HHG861817A	10C	0	0	0	73	5	0
226:A	HHG861817A	4C	2	0	0	0	0	0
227:A	CNX861817A	10B	0	0	85	0	0	0
228:A	CNX861817A	4B	0	75	0	0	0	0
229:A	GEN860119A	10C	2659	2241	1591	406	0	0
230:A	GEN860119A	4C	0	0	443	694	1698	1709
231:A	GEN860119A	10B	0	0	0	0	0	0
232:A	GEN860119A	4B	0	0	0	0	0	0
233:A	POV860119A	10C	491	393	398	351	352	460
234:A	POV860119A	4C	325	639	544	638	655	564
235:A	POV860119A	10B	0	0	0	9	0	1
236:A	POV860119A	4B	0	4	0	14	11	0
237:A	AMO860119A	10C	0	0	0	0	0	0
238:A	AMO860119A	4C	0	0	0	0	0	0
239:A	SPC860119A	10B	72	72	0	0	0	179
240:A	SPC860119A	4B	55	95	21	94	123	144
241:A	HHG860119A	10C	66	69	31	30	11	19
242:A	HHG860119A	4C	15	71	69	66	107	45
243:A	CNX860119A	10C	0	0	0	0	0	0
244:A	CNX860119A	4C	0	0	0	0	0	0
245:A	HHG860119A	10B	0	39	0	0	0	26
246:A	HHG860119A	4B	0	115	0	20	0	0

Figure J-4. Forecast Merge Routine Output
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247:A	SPC860119A	10C	46	198	0	48	12	20
248:A	SPC860119A	4C	9	0	123	34	71	146
249:A	GEN860114A	10C	4213	4351	3134	1924	2267	3817
250:A	GEN860114A	4C	3458	2912	2438	3527	3761	4043
251:A	GEN860114A	10B	74	7	21	0	0	0
252:A	GEN860114A	4B	51	0	35	0	0	0
253:A	SPC860114A	10B	486	577	565	374	509	497
254:A	SPC860114A	4B	481	539	813	678	301	500
255:A	SPC860114A	10C	7	24	25	24	33	11
256:A	SPC860114A	4C	11	9	11	11	20	31
257:A	POV860114A	10B	247	209	208	205	162	224
258:A	POV860114A	4B	212	276	312	382	399	331
259:A	POV860114A	10C	1	0	6	2	12	2
260:A	POV860114A	4C	18	0	0	0	15	4
261:A	HHG860114A	10C	32	22	19	19	25	14
262:A	HHG860114A	4C	8	19	22	15	19	28
263:A	AMO860114A	10C	0	0	0	0	0	0
264:A	AMO860114A	4C	0	0	0	0	0	0
265:A	HHG860114A	10B	0	0	9	6	5	1
266:A	HHG860114A	4B	15	0	5	29	20	7
267:A	GEN860156A	10C	3867	3817	3929	3231	3117	4074
268:A	GEN860156A	4C	3658	3963	3568	3490	4461	4228
269:A	POV860156A	10C	668	579	643	497	445	622
270:A	POV860156A	4C	588	642	649	771	917	970
271:A	SPC860156A	10B	0	13	0	0	0	0
272:A	SPC860156A	4B	0	0	0	0	13	0
273:A	SPC860156A	10C	142	198	119	164	173	95
274:A	SPC860156A	4C	292	134	202	154	169	208
275:A	HHG860156A	10C	0	0	0	0	0	0
276:A	HHG860156A	4C	0	0	0	0	8	4
277:A	CNX860156A	10C	6	12	18	1	19	43
278:A	CNX860156A	4C	5	0	4	8	9	6
279:A	POV860156A	10B	21	0	0	18	0	8
280:A	POV860156A	4B	0	0	0	0	0	16
281:A	GEN860156A	10B	1	19	1	3	27	1
282:A	GEN860156A	4B	1	0	0	0	0	0
283:A	CHL860156A	10C	0	0	0	0	0	0
284:A	CHL860156A	4C	1	0	0	0	0	26
285:A	AMO860156A	10C	0	5	6	13	5	4
286:A	AMO860156A	4C	0	7	2	41	1	4
287:A	GEN860120A	10C	1801	1630	2245	1918	1887	2354
288:A	GEN860120A	4C	2389	2389	2113	1751	1935	1831
289:A	GEN860120A	10B	491	26	0	0	0	0
290:A	GEN860120A	4B	231	0	0	0	0	0
291:A	SPC860120A	10B	2903	0	0	0	0	0
292:A	SPC860120A	4B	0	0	0	726	0	0
293:A	SPC860120A	10C	99	76	51	38	61	25
294:A	SPC860120A	4C	35	34	30	47	47	49
295:A	POV860120A	10C	108	117	105	95	94	80
296:A	POV860120A	4C	78	111	137	98	181	59
297:A	HHG860120A	10C	0	0	0	0	0	0
298:A	HHG860120A	4C	0	0	0	3	0	0
299:A	CHL860120A	10C	0	0	0	0	0	0
300:A	CHL860120A	4C	0	0	0	0	0	3
301:A	POV860120A	10B	0	0	13	0	0	0
302:A	POV860120A	4B	0	0	10	0	0	20
303:A	CNX860120A	10C	0	0	0	2	0	0
304:A	CNX860120A	4C	0	3	3	0	0	26
305:A	FRZ860120A	10C	0	80	2	234	0	181
306:A	FRZ860120A	4C	133	103	128	97	127	171
307:A	GEN860352A	10C	2326	2061	2297	1748	1828	2254
308:A	GEN860352A	4C	2259	2142	2157	2061	2341	2482
309:A	GEN860352A	10B	25	0	241	218	61	94
310:A	GEN860352A	4B	55	0	0	0	192	135
311:A	SPC860352A	10B	0	0	0	7	0	0
312:A	SPC860352A	4B	0	0	0	0	2309	388
313:A	HHG860352A	10C	2	0	0	0	0	0
314:A	HHG860352A	4C	0	0	0	0	0	0
315:A	FRZ860352A	10C	54	33	25	17	26	66
316:A	FRZ860352A	4C	29	64	55	42	63	55
317:A	AMO860352A	10B	0	0	5	0	0	166
318:A	AMO860352A	4B	175	29	25	129	70	188
319:A	AMO860352A	10C	0	0	0	0	0	8
320:A	AMO860352A	4C	0	0	0	2	0	0
321:A	CHL860352A	10C	53	41	37	31	23	9
322:A	CHL860352A	4C	35	7	17	22	44	45
323:A	POV860352A	10C	0	0	0	0	0	10
324:A	POV860352A	4C	0	0	0	16	12	0
325:A	CNX860352A	10B	0	0	104	0	0	142
326:A	CNX860352A	4B	0	0	0	0	0	0
327:A	GEN860451A	10C	658	943	923	812	946	1117
328:A	GEN860451A	4C	1477	1736	997	1301	883	902

Figure J-4. Forecast Merge Routine Output
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329:A	GEN860451A	10B	809	318	833	1129	500	1418
330:A	GEN860451A	4B	945	1114	660	1645	885	1339
331:A	POV860451A	10C	91	108	93	80	104	74
332:A	POV860451A	4C	135	166	194	271	276	238
333:A	SPC860451A	10B	0	405	8	139	27	0
334:A	SPC860451A	4B	0	32	13	0	0	9
335:A	SPC860451A	10C	0	1045	0	0	0	5
336:A	SPC860451A	4C	0	0	11	0	0	19
337:A	POV862703A	10B	1742	2148	1779	1527	1552	1909
338:A	POV862703A	4B	1753	3275	3443	3287	2609	1864
339:A	HHG862703A	10B	0	0	17	0	0	0
340:A	HHG862703A	4B	0	0	38	0	30	16
341:A	HHG862703A	10C	77	18	42	6	0	0
342:A	HHG862703A	4C	0	0	0	0	47	182
343:A	GEN862703A	10B	0	0	0	0	0	0
344:A	GEN862703A	4B	0	0	5	0	0	0
345:A	SPC862703A	10B	5	0	0	0	0	0
346:A	SPC862703A	4B	1	0	21	0	0	0
347:A	AMO862703A	10B	0	0	0	0	0	0
348:A	AMO862703A	4B	0	0	0	87	0	0
349:A	GEN860356A	10C	2513	2579	1463	1608	1413	1912
350:A	GEN860356A	4C	2021	2055	2933	2930	2883	3012
351:A	POV860356A	10C	70	38	39	62	30	54
352:A	POV860356A	4C	42	97	83	136	80	61
353:A	CHL860356A	10C	0	115	24	67	16	52
354:A	CHL860356A	4C	21	40	15	4	13	32
355:A	FRZ860356A	10C	48	46	23	58	32	67
356:A	FRZ860356A	4C	41	51	45	46	59	55
357:A	HHG860356A	10C	0	0	0	0	0	0
358:A	HHG860356A	4C	0	0	0	0	0	0
359:A	GEN860332A	10C	2175	1808	1765	1930	1874	2281
360:A	GEN860332A	4C	2466	2543	2618	2713	2372	2380
361:A	GEN860332A	10B	28	7	32	22	4	122
362:A	GEN860332A	4B	31	42	21	20	33	18
363:A	CHL860332A	10C	43	59	48	59	49	35
364:A	CHL860332A	4C	26	37	33	47	43	47
365:A	HHG860332A	10C	56	31	4	28	40	8
366:A	HHG860332A	4C	24	50	50	88	78	53
367:A	FRZ860332A	10C	65	50	54	68	45	61
368:A	FRZ860332A	4C	58	65	85	87	86	84
369:A	POV860332A	10C	10	8	11	18	20	6
370:A	POV860332A	4C	10	18	15	21	22	21
371:A	SPC860332A	10B	128	0	0	0	0	0
372:A	SPC860332A	4B	32	94	0	0	0	78
373:A	SPC860332A	10C	0	0	0	23	0	0
374:A	SPC860332A	4C	9	0	0	0	131	0
375:A	AMO860332A	10C	0	30	0	0	0	0
376:A	AMO860332A	4C	92	0	0	0	0	0
377:A	GEN860317A	10C	515	577	295	398	258	456
378:A	GEN860317A	4C	493	307	513	336	348	484
379:A	POV860317A	10C	0	0	0	0	0	0
380:A	POV860317A	4C	0	0	0	0	0	0
381:A	GEN860328A	10C	1145	1045	1050	965	936	1087
382:A	GEN860328A	4C	1262	1237	1001	1053	1008	1128
383:A	GEN860328A	10B	59	68	71	22	54	79
384:A	GEN860328A	4B	21	35	55	13	38	19
385:A	FRZ860328A	10C	4	17	0	36	0	83
386:A	FRZ860328A	4C	39	55	28	27	25	17
387:A	SPC860328A	10B	60	9	0	0	0	0
388:A	SPC860328A	4B	0	0	0	19	0	0
389:A	SPC860328A	10C	0	6	9	0	0	20
390:A	SPC860328A	4C	0	0	13	13	0	0
391:A	CHL860328A	10C	0	0	0	20	0	20
392:A	CHL860328A	4C	0	0	0	0	0	0
393:A	HHG860328A	10C	68	46	37	51	18	48
394:A	HHG860328A	4C	66	51	121	92	59	74
395:A	BLK860328A	10C	0	0	0	0	0	0
396:A	BLK860328A	4C	0	0	0	0	0	0
397:A	AMO860328A	10C	1	0	0	0	0	0
398:A	AMO860328A	4C	3	0	0	0	1	0
399:A	CCT861718A	10B	2922	3245	2061	2056	2783	2675
400:A	CCT861718A	4B	2136	2991	2577	2451	2711	2401
401:A	SPC861718A	10B	438	67	0	0	0	0
402:A	SPC861718A	4B	0	0	0	0	0	0
403:A	GEN861718A	10C	0	0	0	0	0	0
404:A	GEN861718A	4C	0	0	0	0	0	0
405:A	HHG861718A	10B	0	0	0	2	0	0
406:A	HHG861718A	4B	0	0	0	0	0	0
407:A	GEN861718A	10B	0	0	0	0	0	0
408:A	GEN861718A	4B	0	0	56	9	0	1
409:A	HHG861718A	10C	0	5	0	0	10	9
410:A	HHG861718A	4C	0	2	0	0	0	8

Figure J-4. Forecast Merge Routine Output
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411:A	CCT862020A	10B	172	178	154	135	146	154
412:A	CCT862020A	4B	154	122	108	64	74	65
413:A	SPC862020A	10B	1155	707	678	726	517	654
414:A	SPC862020A	4B	860	611	918	473	876	804
415:A	GEN862020A	10B	83	0	83	5	0	24
416:A	GEN862020A	4B	0	0	0	0	0	0
417:A	POV862020A	10B	0	0	0	0	2	1
418:A	POV862020A	4B	6	14	7	0	0	0
419:A	HHG862020A	10B	0	0	0	0	0	0
420:A	HHG862020A	4B	5	0	12	0	0	0
421:A	POV860127A	10C	592	505	616	621	508	641
422:A	POV860127A	4C	675	794	946	1210	980	759
423:A	POV860127A	10B	0	0	0	0	0	0
424:A	POV860127A	4B	0	0	0	0	0	0
425:A	GEN860127A	10C	488	483	568	628	617	655
426:A	GEN860127A	4C	629	634	700	868	826	642
427:A	GEN860127A	10B	69	0	0	0	0	0
428:A	GEN860127A	4B	0	0	0	0	0	0
429:A	SPC860127A	10B	0	0	406	0	0	0
430:A	SPC860127A	4B	0	286	260	0	70	157
431:A	HHG860127A	10C	4	19	35	28	8	64
432:A	HHG860127A	4C	33	11	33	227	172	104
433:A	GEN860256A	10C	84	0	0	0	0	0
434:A	GEN860256A	4C	0	0	0	0	0	0
435:A	GEN860256A	10B	234	617	216	269	39	387
436:A	GEN860256A	4B	280	95	880	110	245	28
437:A	SPC860256A	10B	312	368	0	437	0	3888
438:A	SPC860256A	4B	0	50	36	0	0	0
439:A	POV860256A	10B	116	162	145	221	97	243
440:A	POV860256A	4B	0	0	0	0	0	0
441:A	HHG860256A	10B	8	12	1	20	11	14
442:A	HHG860256A	4B	0	0	20	0	0	0
443:A	HHG860256A	10C	0	0	0	0	0	21
444:A	HHG860256A	4C	0	23	42	25	12	37
445:A	SPC860151A	10B	98	232	0	17	1200	202
446:A	SPC860151A	4B	0	410	150	0	659	198
447:A	GEN860151A	10C	262	106	197	125	77	713
448:A	GEN860151A	4C	102	232	227	76	205	43
449:A	GEN860151A	10B	50	74	94	71	70	125
450:A	GEN860151A	4B	63	1	22	141	0	85
451:A	SPC860151A	10C	288	262	106	197	125	77
452:A	SPC860151A	4C	713	102	232	227	76	205
453:A	GEN860123A	10C	591	572	513	543	425	348
454:A	GEN860123A	4C	490	548	407	619	587	501
455:A	GEN860123A	10B	0	0	0	0	0	0
456:A	GEN860123A	4B	0	0	0	0	0	0
457:A	FRZ860123A	10C	170	151	156	188	177	165
458:A	FRZ860123A	4C	171	156	141	153	148	129
459:A	POV860123A	10B	19	0	0	0	0	0
460:A	POV860123A	4B	0	0	0	0	0	0
461:A	SPC860123A	10C	0	0	0	0	0	0
462:A	SPC860123A	4C	0	0	21	0	0	19
463:A	POV860123A	10C	0	0	15	0	0	0
464:A	POV860123A	4C	0	0	25	14	12	9
465:A	POV862504A	10C	274	598	460	282	257	423
466:A	POV862504A	4C	309	775	920	435	207	147
467:A	GEN862504A	10C	57	31	20	17	38	20
468:A	GEN862504A	4C	37	20	10	14	19	15
469:A	SPC862504A	10C	0	0	0	0	0	0
470:A	SPC862504A	4C	0	0	0	0	4	0
471:A	CNX862504A	10C	0	0	0	0	4	0
472:A	CNX862504A	4C	0	0	0	0	0	101
473:A	POV862504A	10B	0	0	0	0	0	0
474:A	POV862504A	4B	0	0	0	133	30	44
475:A	GEN865251A	10C	0	0	0	0	0	0
476:A	GEN865251A	4C	0	0	0	0	0	0
477:A	GEN865251A	10B	0	0	0	0	0	0
478:A	GEN865251A	4B	0	0	0	0	0	0
479:A	SPC865251A	10B	0	0	14	0	0	0
480:A	SPC865251A	4B	0	0	0	0	0	0
481:A	HHG865251A	10B	0	0	0	0	0	0
482:A	HHG865251A	4B	0	0	0	0	0	0
483:A	POV865251A	10B	0	3	3	2	8	0
484:A	POV865251A	4B	0	3	2	6	6	2
485:A	GEN860329A	10B	7	0	0	0	0	0
486:A	GEN860329A	4B	0	0	0	0	0	0
487:A	POV860329A	10B	25	57	76	51	35	48
488:A	POV860329A	4B	47	52	58	47	55	62
489:A	FRZ860329A	10C	36	30	27	31	29	34
490:A	FRZ860329A	4C	39	41	35	51	51	48
491:A	SPC860329A	10B	0	0	0	0	0	0
492:A	SPC860329A	4B	0	0	0	16	0	0

Figure J-4. Forecast Merge Routine Output
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493:A	HHG860329A	10C	0	0	0	0	0	0
494:A	HHG860329A	4C	0	0	0	0	0	0
495:A	CHL860329A	10C	13	15	10	13	15	6
496:A	CHL860329A	4C	9	8	8	23	12	22
497:A	GEN860251A	10B	9	62	80	35	20	40
498:A	GEN860251A	4B	25	1	69	7	0	47
499:A	AMO860251A	10B	0	0	0	0	0	1
500:A	AMO860251A	4B	0	0	0	0	0	1
501:A	GEN865103A	10C	102	69	44	52	78	111
502:A	GEN865103A	4C	78	186	165	157	56	77
503:A	SPC865103A	10B	0	0	0	0	0	0
504:A	SPC865103A	4B	478	0	0	0	0	0
505:A	POV865103A	10C	0	0	0	0	0	0
506:A	POV865103A	4C	0	0	0	0	0	0
507:A	POV865103A	10B	0	0	0	0	0	0
508:A	POV865103A	4B	15	11	77	14	48	10
509:A	AMO865103A	10B	337	140	3	0	14	0
510:A	AMO865103A	4B	8	280	0	0	600	245
511:A	HHG865103A	10B	37	25	40	61	37	73
512:A	HHG865103A	4B	60	108	73	43	76	36
513:A	HHG865103A	10C	255	61	71	32	16	0
514:A	HHG865103A	4C	63	31	62	40	29	0
515:A	POV862001A	10C	48	55	57	47	37	51
516:A	POV862001A	4C	104	91	165	75	61	47
517:A	HHG862001A	10C	0	0	0	0	0	0
518:A	HHG862001A	4C	0	0	0	0	0	0
519:A	GEN862001A	10B	320	0	0	0	0	0
520:A	GEN862001A	4B	0	0	0	0	0	0
521:A	GEN862001A	10C	0	0	0	0	0	0
522:A	GEN862001A	4C	0	0	0	0	0	0
523:A	GEN865051A	10B	139	70	87	70	5	0
524:A	GEN865051A	4B	0	0	0	0	0	0
525:A	GEN865051A	10C	0	5	0	0	0	1
526:A	GEN865051A	4C	0	9	0	0	0	0
527:A	HHG865051A	10B	0	0	10	0	0	0
528:A	HHG865051A	4B	2	0	8	7	8	0
529:A	GEN860218A	10B	0	0	0	0	0	0
530:A	GEN860218A	4B	0	0	0	0	0	0
531:A	SPC860218A	10B	0	0	0	406	0	0
532:A	SPC860218A	4B	0	0	0	220	63	259
533:A	POV860218A	10C	2	0	0	0	0	0
534:A	POV860218A	4C	0	0	0	0	0	0
535:A	HHG860218A	10C	0	2	0	0	0	0
536:A	HHG860218A	4C	0	0	0	0	0	0
537:A	GEN864601A	10B	0	0	0	0	0	60
538:A	GEN864601A	4B	0	173	0	0	0	0
539:A	POV864601A	10B	2	0	0	2	0	0
540:A	POV864601A	4B	0	0	0	0	0	0
541:A	CNX861401A	10B	0	0	0	0	0	0
542:A	CNX861401A	4B	0	0	0	0	0	0
543:A	POV861401A	10B	145	76	88	119	76	82
544:A	POV861401A	4B	82	141	246	133	161	93
545:A	GEN861401A	10B	0	0	0	0	0	0
546:A	GEN861401A	4B	0	0	0	0	0	0
547:A	GEN861401A	10C	13	52	0	1	9	39
548:A	GEN861401A	4C	0	0	0	0	0	0
549:A	SPC861401A	10B	136	0	0	0	0	0
550:A	SPC861401A	4B	0	0	0	0	0	0
551:A	HHG861401A	10C	0	0	0	1	0	0
552:A	HHG861401A	4C	0	0	16	3	67	64
553:A	HHG861401A	10B	0	0	6	0	2	0
554:A	HHG861401A	4B	0	0	7	0	0	0
555:A	POV865601A	10B	0	0	0	0	0	0
556:A	POV865601A	4B	0	7	74	5	0	0
557:A	GEN865601A	10C	50	0	0	0	0	0
558:A	GEN865601A	4C	0	0	0	0	0	0
559:A	GEN8656..1A	10B	0	0	0	0	0	19
560:A	GEN865601A	4B	4	0	0	0	0	0
561:A	HHG865601A	10C	22	22	8	3	1	6
562:A	HHG865601A	4C	0	0	0	0	0	0
563:A	HHG865601A	10B	0	0	0	0	0	0
564:A	HHG865601A	4B	0	0	0	0	3	0
565:A	SPC865601A	10B	0	2	23	16	13	13
566:A	SPC865601A	4B	17	63	5	17	0	14
567:A	GEN861720A	10C	125	116	98	77	50	50
568:A	GEN861720A	4C	72	47	50	50	14	50
569:A	GEN861720A	10B	0	0	0	0	0	0
570:A	GEN861720A	4B	0	0	0	0	0	0
571:A	FRZ861720A	10C	0	0	52	62	66	28
572:A	FRZ861720A	4C	0	0	0	0	0	0
573:A	POV861720A	10B	0	0	9	0	0	0
574:A	POV861720A	4B	0	0	0	9	0	0

Figure J-4. Forecast Merge Routine Output
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575:A	CHL861720A	10C	0	0	1	1	0	0
576:A	CHL861720A	4C	0	0	0	0	0	0
577:A	POV861901A	10B	0	0	0	0	0	0
578:A	POV861901A	4B	0	0	0	0	0	0
579:A	HHG861901A	10C	49	40	44	49	31	50
580:A	HHG861901A	4C	43	3	56	63	43	91
581:A	GEN861901A	10C	10	0	0	0	0	0
582:A	GEN861901A	4C	0	0	0	38	0	73
583:A	POV862701A	10C	0	0	0	0	0	0
584:A	POV862701A	4C	0	237	734	670	575	378
585:A	SPC862701A	10B	35	29	9	11	12	66
586:A	SPC862701A	4B	23	57	63	148	25	52
587:A	GEN862701A	10B	20	0	0	0	0	0
588:A	GEN862701A	4B	0	0	0	0	0	0
589:A	GEN860427A	10B	38	32	0	0	0	3
590:A	GEN860427A	4B	0	0	0	0	0	0
591:A	POV860427A	10B	193	190	192	247	188	232
592:A	POV860427A	4B	212	251	361	512	356	376
593:A	POV860427A	10C	5	4	1	1	1	3
594:A	POV860427A	4C	1	1	2	3	2	2
595:A	HHG860427A	10C	0	4	0	0	0	0
596:A	HHG860427A	4C	0	6	0	4	0	0
597:A	CHL860427A	10C	0	150	0	0	0	0
598:A	CHL860427A	4C	0	0	0	0	0	0
599:A	HHG865203A	10B	0	0	0	0	0	0
600:A	HHG865203A	4B	0	0	0	0	0	0
601:A	GEN865203A	10B	1	5	0	0	4	0
602:A	GEN865203A	4B	0	106	492	0	0	0
603:A	GEN865203A	10C	0	0	0	0	0	0
604:A	GEN865203A	4C	0	0	0	0	0	0
605:A	AMO865203A	10B	0	0	0	0	0	0
606:A	AMO865203A	4B	101	0	232	0	0	0
607:A	SPC865203A	10B	0	0	0	0	0	5
608:A	SPC865203A	4B	0	0	489	0	0	0
609:A	POV865203A	10C	0	0	0	0	0	0
610:A	POV865203A	4C	0	0	0	0	0	0
611:A	POV865203A	10B	0	0	0	0	0	0
612:A	POV865203A	4B	0	0	0	0	0	0
613:A	POV860301A	10B	94	147	155	147	74	79
614:A	POV860301A	4B	150	159	232	175	157	148
615:A	GEN860301A	10B	2	29	25	5	27	0
616:A	GEN860301A	4B	0	0	8	2	0	0
617:A	GEN860146A	10C	221	155	220	119	271	187
618:A	GEN860146A	4C	218	189	247	332	215	310
619:A	SPC860146A	10C	0	0	0	0	0	0
620:A	SPC860146A	4C	0	0	0	0	55	11
621:A	POV860103A	10C	177	166	152	111	153	110
622:A	POV860103A	4C	126	146	190	179	501	131
623:A	SPC860227A	10B	958	287	0	451	1787	5302
624:A	SPC860227A	4B	0	1479	0	0	0	4715
625:A	POV860227A	10B	58	93	50	210	128	82
626:A	POV860227A	4B	126	108	156	118	144	71
627:A	GEN860227A	10B	0	0	0	0	11	0
628:A	GEN860227A	4B	19	0	0	0	0	0
629:A	HHG860227A	10B	7	2	0	2	0	12
630:A	HHG860227A	4B	0	0	0	0	0	0
631:A	GEN860214A	10B	0	0	0	0	0	0
632:A	GEN860214A	4B	0	6	0	0	0	0
633:A	POV860214A	10C	169	111	151	97	129	136
634:A	POV860214A	4C	116	138	164	203	199	153
635:A	POV860214A	10B	28	43	41	0	42	23
636:A	POV860214A	4B	24	33	63	42	8	46
637:A	SPC860214A	10C	0	0	0	0	0	0
638:A	SPC860214A	4C	0	0	0	0	0	43
639:A	SPC860214A	10B	0	0	0	295	0	0
640:A	SPC860214A	4B	0	0	0	0	51	51
641:A	HHG860214A	10C	34	15	18	16	14	14
642:A	HHG860214A	4C	25	21	15	26	27	25
643:A	SPC861801A	10C	281	0	0	0	0	0
644:A	SPC861801A	4C	0	30	8	0	0	0
645:A	POV861801A	10C	0	8	0	0	0	0
646:A	POV861801A	4C	0	9	31	64	41	10
647:A	POV861801A	10B	0	0	0	0	0	0
648:A	POV861801A	4B	0	12	0	0	0	0
649:A	HHG861801A	10C	2	0	0	0	0	0
650:A	HHG861801A	4C	0	0	0	4	0	0
651:A	GEN860452A	10B	51	35	14	110	10	93
652:A	GEN860452A	4B	33	11	15	22	87	81
653:A	HHG860452A	10C	16	8	13	10	15	9
654:A	HHG860452A	4C	12	11	13	25	21	19
655:A	CHL860452A	10C	0	68	0	0	0	0
656:A	CHL860452A	4C	0	0	0	0	0	0

Figure J-4. Forecast Merge Routine Output
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657:A	POV860452A	10C	0	0	0	0	0	0
658:A	POV860452A	4C	0	0	0	0	18	11
659:A	GEN860450A	10B	22	25	15	35	24	40
660:A	GEN860450A	4B	50	46	24	53	69	53
661:A	FRZ860450A	10C	40	43	0	0	0	0
662:A	FRZ860450A	4C	0	0	0	0	0	0
663:A	CHL860450A	10C	0	241	0	0	0	0
664:A	CHL860450A	4C	0	0	0	0	0	0
665:A	POV860450A	10C	0	0	0	0	0	0
666:A	POV860450A	4C	0	10	0	0	0	0
667:A	HHG860450A	10C	0	0	0	5	0	3
668:A	HHG860450A	4C	0	0	0	8	7	4
669:A	GEN860210A	10B	53	147	71	108	62	77
670:A	GEN860210A	4B	52	56	183	69	393	233
671:A	POV860456A	10C	7	2	0	1	2	3
672:A	POV860456A	4C	8	11	4	3	17	19
673:A	POV865602A	10B	0	0	0	0	0	0
674:A	POV865602A	4B	0	0	0	0	0	0
675:A	POV865602A	10C	218	111	116	148	92	119
676:A	POV865602A	4C	20	408	0	477	228	88
677:A	SPC865602A	10B	0	0	0	0	58	0
678:A	SPC865602A	4B	1619	3888	0	0	29	0
679:A	GEN865602A	10B	0	0	0	0	9	0
680:A	GEN865602A	4B	1	9	26	0	0	29
681:A	GEN865602A	10C	36	12	41	0	18	9
682:A	GEN865602A	4C	0	12	1	50	20	29
683:A	SPC860115A	10C	0	38	13	0	0	0
684:A	SPC860115A	4C	0	0	0	0	0	20
685:A	GEN860115A	10B	98	86	91	84	294	112
686:A	GEN860115A	4B	84	130	87	85	395	91
687:A	GEN860115A	10C	0	209	0	0	0	446
688:A	GEN860115A	4C	84	197	89	31	0	0
689:A	POV860115A	10B	7	0	6	0	0	0
690:A	POV860115A	4B	0	0	0	1	4	23
691:A	HHG860115A	10B	0	0	0	0	0	0
692:A	HHG860115A	4B	0	0	0	0	57	0
693:A	POV865101A	10B	0	0	0	0	0	0
694:A	POV865101A	4B	0	0	134	0	0	0
695:A	POV865101A	10C	108	136	90	21	37	85
696:A	POV865101A	4C	244	299	697	376	263	225
697:A	SPC865101A	10B	36	0	0	12	0	0
698:A	SPC865101A	4B	0	35	0	0	0	22
699:A	GEN865101A	10B	0	0	0	4	0	0
700:A	GEN865101A	4B	0	0	162	45	46	42
701:A	HHG865101A	10B	5	7	12	12	11	23
702:A	HHG865101A	4B	10	9	13	20	9	12
703:A	AMO865101A	10B	0	0	0	1	0	0
704:A	AMO865101A	4B	2	0	0	0	0	0
705:A	GEN861301A	10B	0	0	0	0	0	0
706:A	GEN861301A	4B	0	0	0	0	0	0
707:A	POV861301A	10B	0	0	0	0	14	0
708:A	POV861301A	4B	0	0	8	7	0	0
709:A	GEN865102A	10B	0	0	0	0	0	0
710:A	GEN865102A	4B	0	0	0	0	0	0
711:A	POV865102A	10B	0	0	0	0	0	0
712:A	POV865102A	4B	0	0	17	0	0	0
713:A	POV865102A	10C	18	53	59	47	70	20
714:A	POV865102A	4C	63	128	333	127	86	87
715:A	HHG865102A	10B	6	6	28	31	11	14
716:A	HHG865102A	4B	14	12	11	10	9	12
717:A	AMO865102A	10B	0	0	0	0	0	0
718:A	AMO865102A	4B	0	0	0	0	0	0
719:A	GEN860102A	10B	0	0	0	0	0	0
720:A	GEN860102A	4B	0	0	99	0	73	0
721:A	POV860102A	10B	0	0	0	0	0	0
722:A	POV860102A	4B	0	0	0	0	0	0
723:A	GEN865232A	10B	0	0	0	0	0	0
724:A	GEN865232A	4B	0	0	0	0	0	0
725:A	GEN865152A	10B	0	0	0	0	0	0
726:A	GEN865152A	4B	0	0	0	0	397	632
727:A	HHG865152A	10B	2	4	7	0	1	4
728:A	HHG865152A	4B	7	5	7	0	2	5
729:A	AMO865152A	10B	16	0	0	53	0	0
730:A	AMO865152A	4B	0	0	0	0	87	0
731:A	POV861703A	10B	0	0	0	0	0	0
732:A	POV861703A	4B	121	185	0	0	0	0
733:A	POV861703A	10C	26	30	37	21	27	10
734:A	POV861703A	4C	354	0	0	30	40	9
735:A	HHG862803A	10B	13	0	15	0	0	15
736:A	HHG862803A	4B	0	0	0	0	0	16
737:A	GEN862803A	10C	49	115	76	89	81	45
738:A	GEN862803A	4C	59	66	58	78	53	52

Figure J-4. Forecast Merge Routine Output
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739:A	GEN862803A	10B	0	0	37	0	0	0
740:A	GEN862803A	4B	0	0	0	102	15	19
741:A	GEN860220A	10B	0	94	0	0	0	0
742:A	GEN860220A	4B	0	0	0	0	0	0
743:A	POV860220A	10C	8	0	0	0	0	0
744:A	POV860220A	4C	0	0	0	0	0	0
745:A	GEN860223A	10B	0	8	0	0	0	44
746:A	GEN860223A	4B	0	0	88	3	0	0
747:A	GEN860223A	10C	0	0	0	0	0	11
748:A	GEN860223A	4C	0	0	0	0	0	0
749:A	POV860223A	10B	6	0	0	0	0	4
750:A	POV860223A	4B	1	3	0	0	9	0
751:A	GEN860121A	10B	0	0	0	0	0	0
752:A	GEN860121A	4B	0	0	0	0	0	0
753:A	GEN860121A	10C	124	15	8	0	6	0
754:A	GEN860121A	4C	45	0	4	0	1	0
755:A	POV860121A	10B	0	2	0	0	0	0
756:A	POV860121A	4B	0	5	16	16	16	8
757:A	GEN861501A	10B	0	0	0	0	0	0
758:A	GEN861501A	4B	0	1480	154	0	0	0
759:A	GEN860219A	10C	0	0	0	0	0	0
760:A	GEN860219A	4C	0	0	0	0	0	0
761:A	GEN860219A	10B	24	0	9	0	0	0
762:A	GEN860219A	4B	0	0	1	0	0	0
763:A	POV860219A	10C	0	0	0	0	0	11
764:A	POV860219A	4C	0	0	0	0	0	0
765:A	GEN865250A	10C	107	41	49	39	61	61
766:A	GEN865250A	4C	42	68	144	154	143	216
767:A	SPC865250A	10B	0	0	134	0	0	109
768:A	SPC865250A	4B	77	0	0	185	9	0
769:A	HHG865250A	10B	8	2	0	0	4	3
770:A	HHG865250A	4B	0	0	0	0	0	6
771:A	POV865250A	10B	0	0	0	0	2	0
772:A	POV865250A	4B	0	0	9	0	0	0
773:A	SPC865052A	10B	0	0	0	0	0	6
774:A	SPC865052A	4B	0	0	0	0	0	0
775:A	HHG865052A	10B	0	0	0	4	0	0
776:A	HHG865052A	4B	0	0	44	0	0	0
777:A	POV865052A	10B	0	0	0	0	0	0
778:A	POV865052A	4B	0	0	10	0	0	0
779:A	POV861902A	10C	50	31	49	37	55	42
780:A	POV861902A	4C	31	32	54	53	38	24
781:A	GEN861902A	10C	13	0	0	0	93	0
782:A	GEN861902A	4C	0	0	0	140	0	0
783:A	GEN860113A	10B	52	273	82	77	77	69
784:A	GEN860113A	4B	77	73	72	67	65	62
785:A	HHG860113A	10B	63	58	3	0	27	52
786:A	HHG860113A	4B	53	11	46	0	0	4
787:A	POV860113A	10B	3	0	7	2	0	0
788:A	POV860113A	4B	0	0	8	19	11	11
789:A	AMO860113A	10B	0	1	0	0	0	0
790:A	AMO860113A	4B	0	0	0	0	0	12
791:A	GEN860215A	10B	1543	832	391	0	0	0
792:A	GEN860215A	4B	0	0	0	0	0	0
793:A	GEN860215A	10C	0	0	0	0	2	202
794:A	GEN860215A	4C	863	314	0	0	0	0
795:A	POV860215A	10B	3	0	7	6	1	0
796:A	POV860215A	4B	0	0	0	0	0	0
797:A	GEN865003A	10C	1	0	0	0	0	0
798:A	GEN865003A	4C	0	0	0	0	0	0
799:A	HHG865003A	10C	5	0	3	3	1	0
800:A	HHG865003A	4C	7	4	19	18	7	7
801:A	HHG865003A	10B	15	0	0	0	0	0
802:A	HHG865003A	4B	0	0	0	11	19	21
803:A	POV865003A	10C	0	3	2	0	0	0
804:A	POV865003A	4C	0	0	0	3	0	0
805:A	POV865003A	10B	0	0	0	0	0	0
806:A	POV865003A	4B	14	0	0	0	0	0
807:A	SPC860101A	10B	0	0	1323	0	0	1984
808:A	SPC860101A	4B	0	1323	0	0	0	0
809:A	GEN861402A	10C	0	0	0	0	0	0
810:A	GEN861402A	4C	18	0	0	0	6	0
811:A	SPC861402A	10B	0	0	0	0	0	263
812:A	SPC861402A	4B	0	100	61	0	0	0
813:A	SPC861402A	10C	0	0	0	8	0	0
814:A	SPC861402A	4C	6	0	0	0	0	0
815:A	HHG861402A	10C	0	0	0	0	0	0
816:A	HHG861402A	4C	0	0	0	0	0	0
817:A	POV865603A	10C	103	100	122	47	57	50
818:A	POV865603A	4C	109	101	137	105	67	67
819:A	POV865603A	10B	0	0	0	0	20	20
820:A	POV865603A	4B	0	0	0	0	0	0

Figure J-4. Forecast Merge Routine Output
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821:A	GEN865603A	10C	2	10	0	0	0	0
822:A	GEN865603A	4C	1	22	0	37	0	18
823:A	GEN865603A	10B	0	0	0	0	0	0
824:A	GEN865603A	4B	0	6	197	0	0	0
825:A	HHG865603A	10C	0	0	0	0	0	0
826:A	HHG865603A	4C	0	0	0	0	0	0
827:A	SPC865603A	10B	0	0	0	0	57	131
828:A	SPC865603A	4B	0	0	0	0	0	0
829:A	GEN860129A	10B	0	0	0	25	0	0
830:A	GEN860129A	4B	0	0	0	0	0	0
831:A	SPC860129A	10B	0	0	0	0	0	0
832:A	SPC860129A	4B	0	74	0	0	0	0
833:A	POV860129A	10C	21	22	13	16	25	24
834:A	POV860129A	4C	22	14	18	26	24	18
835:A	CHL860432A	10C	0	149	0	0	0	0
836:A	CHL860432A	4C	0	0	0	0	0	0
837:A	POV860432A	10C	21	9	0	0	0	9
838:A	POV860432A	4C	0	0	9	32	48	0
839:A	HHG860432A	10C	0	0	0	3	0	0
840:A	HHG860432A	4C	0	10	0	0	41	8
841:A	GEN860152A	10B	0	0	0	0	0	0
842:A	GEN860152A	4B	0	0	6	0	0	73
843:A	SPC860152A	10B	72	0	0	0	0	0
844:A	SPC860152A	4B	91	490	242	0	0	0
845:A	AMO860310A	10B	202	347	112	103	548	121
846:A	AMO860310A	4B	101	270	171	184	95	87
847:A	GEN860310A	10B	57	198	0	0	78	504
848:A	GEN860310A	4B	736	181	0	92	0	0
849:A	GEN865229A	10C	198	158	42	66	37	177
850:A	GEN865229A	4C	139	98	76	183	151	248
851:A	SPC865127A	10B	0	0	106	92	25	0
852:A	SPC865127A	4B	157	0	164	0	118	52
853:A	GEN865127A	10B	0	0	0	0	0	0
854:A	GEN865127A	4B	0	0	0	0	0	0
855:A	POV865127A	10B	19	0	15	9	6	2
856:A	POV865127A	4B	11	14	30	32	29	10
857:A	POV865127A	10C	0	0	22	13	0	0
858:A	POV865127A	4C	9	15	0	0	0	0
859:A	HHG865127A	10B	5	6	75	0	6	0
860:A	HHG865127A	4B	5	0	31	0	36	0
861:A	POV860302A	10B	36	56	44	35	20	12
862:A	POV860302A	4B	44	19	51	53	30	45
863:A	GEN860302A	10B	10	7	0	0	0	0
864:A	GEN860302A	4B	0	0	0	0	0	0
865:A	SPC862751A	10B	15	0	0	0	0	0
866:A	SPC862751A	4B	247	185	163	134	164	131
867:A	GEN862751A	10B	1	0	2	47	40	0
868:A	GEN862751A	4B	4	2	13	0	0	5
869:A	GEN862751A	10C	0	0	0	23	0	0
870:A	GEN862751A	4C	0	0	0	0	10	0
871:A	POV862751A	10B	10	4	3	21	14	1
872:A	POV862751A	4B	10	34	23	19	21	19
873:A	POV862751A	10C	0	0	0	0	0	0
874:A	POV862751A	4C	0	9	0	0	0	0
875:A	GEN865227A	10C	0	0	0	0	0	0
876:A	GEN865227A	4C	0	0	0	0	0	289
877:A	GEN865227A	10B	28	10	4	3	6	32
878:A	GEN865227A	4B	11	3	5	5	22	4
879:A	HHG865227A	10B	11	1	0	0	5	7
880:A	HHG865227A	4B	0	4	0	25	1	16
881:A	HHG865227A	10C	0	0	1	35	2	6
882:A	HHG865227A	4C	0	0	71	0	27	0
883:A	POV865227A	10B	0	0	0	0	0	0
884:A	POV865227A	4B	0	0	3	0	3	3
885:A	GEN865201A	10B	0	8	0	33	6	0
886:A	GEN865201A	4B	6	0	0	0	0	0
887:A	POV865201A	10C	0	0	0	0	0	0
888:A	POV865201A	4C	0	0	13	0	0	0
889:A	POV865201A	10B	4	14	23	10	0	0
890:A	POV865201A	4B	0	0	0	0	0	0
891:A	HHG865201A	10C	51	42	7	0	12	0
892:A	HHG865201A	4C	0	0	30	0	0	0
893:A	GEN863250A	10B	0	0	0	0	0	0
894:A	GEN863250A	4B	0	0	5	0	0	21
895:A	GEN863251A	10C	0	0	0	0	0	0
896:A	GEN863251A	4C	0	0	0	0	0	0
897:A	GEN863251A	10B	0	0	0	0	0	0
898:A	GEN863251A	4B	0	0	0	0	0	0
899:A	HHG863251A	10C	0	50	0	0	23	10
900:A	HHG863251A	4C	0	0	0	34	33	29
901:A	POV863251A	10C	0	0	0	0	29	9
902:A	POV863251A	4C	0	0	0	20	0	8

Figure J-4. Forecast Merge Routine Output
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903:A	GEN862728A	10B	0	0	0	0	0	0
904:A	GEN862728A	4B	0	0	0	0	0	7
905:A	SPC862728A	10B	26	7	35	23	49	52
906:A	SPC862728A	4B	7	55	118	168	42	66
907:A	SPC862728A	10C	69	0	171	31	19	140
908:A	SPC862728A	4C	0	0	0	0	40	0
909:A	HHG862728A	10C	0	0	0	5	13	0
910:A	HHG862728A	4C	0	0	0	32	0	0
911:A	AMU862728A	10C	0	0	0	0	0	0
912:A	AMU862728A	4C	0	0	0	0	0	0
913:A	GEN863203A	10B	5	12	0	0	0	0
914:A	GEN863203A	4B	0	225	0	0	0	0
915:A	HHG863203A	10C	0	0	7	0	0	0
916:A	HHG863203A	4C	0	0	0	0	0	0
917:A	POV863203A	10C	0	0	0	0	0	0
918:A	POV863203A	4C	0	0	0	0	0	0
919:A	GEN862702A	10B	0	0	0	0	0	14
920:A	GEN862702A	4B	0	0	0	0	0	0
921:A	POV862702A	10B	0	0	0	76	0	0
922:A	POV862702A	4B	0	0	0	0	0	0
923:A	HHG865132A	10B	0	0	0	0	0	0
924:A	HHG865132A	4B	10	0	41	0	0	0
925:A	HHG862903A	10C	0	0	0	0	1	0
926:A	HHG862903A	4C	4	0	0	0	0	0
927:A	HHG862903A	10B	0	0	0	0	0	0
928:A	HHG862903A	4B	0	0	0	0	0	0
929:A	GEN862903A	10B	63	32	2	0	0	0
930:A	GEN862903A	4B	0	0	0	0	0	0
931:A	GEN862903A	10C	2	0	1	12	0	0
932:A	GEN862903A	4C	0	0	204	0	0	0
933:A	HHG860333A	10B	0	2	0	0	24	11
934:A	HHG860333A	4B	0	39	55	0	0	0
935:A	GEN860333A	10C	5	0	0	0	0	0
936:A	GEN860333A	4C	0	0	0	0	0	0
937:A	GEN860333A	10B	0	6	0	10	6	13
938:A	GEN860333A	4B	7	6	10	15	4	1
939:A	GEN861717A	10B	0	0	0	0	0	0
940:A	GEN861717A	4B	0	0	0	0	0	0
941:A	HHG861717A	10B	0	0	0	0	0	0
942:A	HHG861717A	4B	0	0	0	0	0	0
943:A	POV865252A	10B	0	0	0	0	0	0
944:A	POV865252A	4B	0	0	0	0	0	0
945:A	GEN860252A	10B	0	0	0	0	0	0
946:A	GEN860252A	4B	0	0	0	0	0	0
947:A	GEN860108A	10M	0	0	0	0	0	0
948:A	GEN860108A	4M	0	0	0	73	0	0
949:A	POV861917A	10C	0	14	0	9	15	0
950:A	POV861917A	4C	19	12	0	10	0	13
951:A	POV865104A	10B	0	0	0	0	0	0
952:A	POV865104A	4B	0	3	17	0	0	0
953:A	HHG865104A	10B	88	14	0	0	27	0
954:A	HHG865104A	4B	0	0	17	0	0	0
955:A	HHG865104A	10C	80	68	2	0	0	0
956:A	HHG865104A	4C	0	0	0	0	0	0
957:A	GEN860232A	10B	0	11	0	1	0	0
958:A	GEN860232A	4B	0	0	0	0	0	0
959:A	GEN861719A	10B	0	0	0	0	26	0
960:A	GEN861719A	4B	0	0	0	0	0	0
961:A	POV861719A	10C	0	0	0	0	0	0
962:A	POV861719A	4C	0	0	0	0	0	0
963:A	HHG865204A	10C	19	1	12	27	15	3
964:A	HHG865204A	4C	10	14	4	15	15	10
965:A	POV865204A	10C	0	0	0	0	0	3
966:A	POV865204A	4C	11	30	0	13	0	0
967:A	GEN862729A	10B	14	8	17	14	16	11
968:A	GEN862729A	4B	9	20	12	12	16	30
969:A	POV862729A	10B	26	3	5	0	0	0
970:A	POV862729A	4B	0	0	0	0	0	11
971:A	POV860144A	10B	0	0	0	0	0	0
972:A	POV860144A	4B	0	0	32	0	0	0
973:A	GEN860144A	10B	0	59	0	144	0	105
974:A	GEN860144A	4B	0	0	0	5	1	7
975:A	GEN863252A	10B	0	0	0	0	0	0
976:A	GEN863252A	4B	0	0	0	0	0	0
977:A	GEN865150A	10C	0	24	0	0	0	0
978:A	GEN865150A	4C	0	0	0	0	0	0
979:A	HHG865150A	10B	4	0	0	0	0	0
980:A	HHG865150A	4B	0	0	0	0	0	54
981:A	GEN865001A	10B	0	0	0	0	0	0
982:A	GEN865001A	4B	0	8	0	0	0	0
983:A	HHG861413A	10C	0	0	0	0	0	12
984:A	HHG861413A	4C	25	0	0	0	0	0

Figure J-4. Forecast Merge Routine Output
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985:A	POV862927A	10B	0	0	16	0	0	0
986:A	POV862927A	4B	0	0	0	0	0	9
987:A	POV862927A	10C	16	0	0	24	0	0
988:A	POV862927A	4C	0	8	38	9	34	18
989:A	HHG862927A	10B	0	2	0	2	0	0
990:A	HHG862927A	4B	0	3	5	6	0	0
991:A	HHG862927A	10C	0	0	0	14	2	0
992:A	HHG862927A	4C	0	0	0	0	0	14
993:A	GEN862017A	10C	45	0	21	36	0	91
994:A	GEN862017A	4C	0	36	0	43	0	0
995:A	GEN862017A	10B	47	6	0	0	0	0
996:A	GEN862017A	4B	0	0	0	0	0	0
997:A	POV862017A	10C	2	0	1	0	0	4
998:A	POV862017A	4C	0	2	1	4	0	0
999:A	GEN862752A	10B	4	2	1	0	0	0
1000:A	GEN862752A	4B	0	0	0	0	0	0
1001:A	HHG862752A	10B	0	0	0	0	0	0
1002:A	HHG862752A	4B	0	0	0	0	41	1
1003:A	GEN862732A	10B	0	0	0	0	0	0
1004:A	GEN862732A	4B	0	0	0	2	0	2
1005:A	GEN862732A	10C	0	0	0	1	0	0
1006:A	GEN862732A	4C	0	0	0	0	2	0
1007:A	POV862732A	10B	0	0	0	8	14	0
1008:A	POV862732A	4B	0	0	11	0	9	0
1009:A	GEN861919A	10M	5	6	3	7	2	2
1010:A	GEN861919A	4M	6	2	2	3	7	6
1011:A	HHG865027A	10C	0	0	0	0	0	0
1012:A	HHG865027A	4C	0	0	0	21	0	0
1013:A	GEN865027A	10B	0	0	0	0	0	0
1014:A	GEN865027A	4B	0	0	0	0	0	0
1015:A	GEN865027A	10C	1	0	0	1	0	0
1016:A	GEN865027A	4C	0	0	1	0	0	0
1017:A	GEN860149A	10B	5	0	0	0	0	0
1018:A	GEN860149A	4B	0	0	3	0	0	0
1019:A	GEN860149A	10C	0	0	30	17	0	0
1020:A	GEN860149A	4C	0	0	0	0	0	0
1021:A	POV860149A	10B	0	0	0	8	0	0
1022:A	POV860149A	4B	0	0	0	9	11	0
1023:A	GEN861802A	10C	0	0	0	2	0	81
1024:A	GEN861802A	4C	27	0	0	0	0	269
1025:A	POV861802A	10C	0	0	0	0	0	0
1026:A	POV861802A	4C	0	0	2	0	0	0
1027:A	GEN861313A	10B	14	0	0	0	0	0
1028:A	GEN861313A	4B	0	0	0	0	0	0
1029:A	POV861920A	10C	0	21	0	0	0	0
1030:A	POV861920A	4C	19	8	0	8	0	11
1031:A	POV865614A	10B	0	0	32	0	0	0
1032:A	POV865614A	4B	0	11	0	25	0	0
1033:A	POV862951A	10B	9	16	16	10	12	13
1034:A	POV862951A	4B	8	14	20	21	12	19
1035:A	HHG862901A	10C	7	0	0	0	2	0
1036:A	HHG862901A	4C	0	0	0	0	0	0
1037:A	HHG862901A	10B	0	0	0	10	0	0
1038:A	HHG862901A	4B	0	1	0	0	0	1
1039:A	POV860145A	10B	0	3	2	0	9	0
1040:A	POV860145A	4B	1	0	0	0	4	0
1041:A	GEN863201A	10B	3	0	0	0	0	192
1042:A	GEN863201A	4B	0	0	0	0	4	0
1043:A	GEN860244A	10B	0	0	0	6	0	0
1044:A	GEN860244A	4B	0	0	0	0	0	0
1045:A	POV860244A	10B	0	2	0	2	0	0
1046:A	POV860244A	4B	0	0	0	8	3	4
1047:A	GEN860122A	10B	0	0	0	0	0	13
1048:A	GEN860122A	4B	0	41	0	0	0	0
1049:A	POV860122A	10B	4	0	0	1	1	5
1050:A	POV860122A	4B	2	10	2	0	4	3
1051:A	HHG860116A	10C	0	0	59	23	0	19
1052:A	HHG860116A	4C	0	0	68	10	0	5
1053:A	POV860116A	10C	0	0	0	0	19	0
1054:A	POV860116A	4C	0	12	34	10	22	0
1055:A	GEN860116A	10C	0	0	3	0	1	0
1056:A	GEN860116A	4C	0	0	0	0	0	1
1057:A	POV861714A	10B	0	0	0	0	0	11
1058:A	POV861714A	4B	39	0	0	15	0	71
1059:A	GEN865202A	10B	0	0	0	0	0	0
1060:A	GEN865202A	4B	0	0	0	0	0	0
1061:A	POV865117A	10C	0	0	0	0	0	0
1062:A	POV865117A	4C	0	20	51	18	0	0
1063:A	POV860130A	10C	0	0	0	0	0	0
1064:A	POV860130A	4C	0	9	8	0	0	0
1065:A	POV860429A	10B	9	4	0	0	0	0
1066:A	POV860429A	4B	0	0	0	2	13	7

Figure J-4. Forecast Merge Routine Output
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1067:A	POV863403A	10B	0	0	0	0	0	0
1068:A	POV863403A	4B	0	0	6	17	0	0
1069:A	HHG860109A	10C	3	4	0	0	0	0
1070:A	HHG860109A	4C	0	6	10	9	0	12
1071:A	POV860109A	10B	0	0	0	0	0	0
1072:A	POV860109A	4B	0	0	8	0	0	0
1073:A	GEN863803A	10B	0	0	192	0	0	0
1074:A	GEN863803A	4B	0	272	0	0	0	0
1075:A	GEN861314A	10B	6	3	0	0	0	10
1076:A	GEN861314A	4B	0	0	0	0	0	0
1077:A	POV860124A	10B	0	0	10	0	0	0
1078:A	POV860124A	4B	0	0	0	0	0	12
1079:A	GEN865002A	10B	0	0	0	0	0	1
1080:A	GEN865002A	4B	0	0	0	0	3	0
1081:A	GEN860133A	10B	0	0	0	0	0	0
1082:A	GEN860133A	4B	0	0	0	0	0	0
1083:A	HHG860133A	10B	0	0	0	0	0	2
1084:A	HHG860133A	4B	0	7	0	0	5	0
1085:A	POV860133A	10C	0	0	0	0	0	0
1086:A	POV860133A	4C	0	0	0	9	10	0
1087:A	POV861756A	10B	0	0	0	0	0	0
1088:A	POV861756A	4B	0	0	12	0	20	32
1089:A	POV860318A	10C	9	8	0	0	0	0
1090:A	POV860318A	4C	8	11	8	0	0	0
1091:A	GEN863227A	10B	0	0	0	0	0	0
1092:A	GEN863227A	4B	0	0	0	16	0	0
1093:A	GEN862738A	10B	0	0	0	82	0	0
1094:A	GEN862738A	4B	0	0	0	0	0	0
1095:A	GEN862738A	10C	11	0	4	1	0	0
1096:A	GEN862738A	4C	9	25	14	1	0	0
1097:A	AMO862738A	10C	0	0	0	0	0	0
1098:A	AMO862738A	4C	11	0	0	0	0	0
1099:A	GEN860339A	10B	0	0	0	0	0	0
1100:A	GEN860339A	4B	0	0	0	0	0	0
1101:A	HHG863202A	10C	0	0	8	18	0	6
1102:A	HHG863202A	4C	16	10	0	2	0	32
1103:A	POV861903A	10C	0	0	0	0	0	0
1104:A	POV861903A	4C	0	0	0	14	30	0
1105:A	HHG862750A	10B	0	0	0	0	0	0
1106:A	HHG862750A	4B	9	0	1	70	16	33
1107:A	HHG861201A	10C	0	0	0	0	0	23
1108:A	HHG861201A	4C	20	0	0	0	0	0
1109:A	HHG860229A	10B	0	0	0	0	0	5
1110:A	HHG860229A	4B	0	0	0	0	0	0
1111:A	SPC865129A	10B	67	0	0	0	0	0
1112:A	SPC865129A	4B	0	0	0	0	0	0
1113:A	GEN860112A	10C	0	0	0	0	0	0
1114:A	GEN860112A	4C	4	0	0	0	0	0
1115:A	HHG865133A	10B	0	14	15	0	0	0
1116:A	HHG865133A	4B	0	0	0	0	0	0
1117:A	SPC862739A	10B	14	0	0	0	0	0
1118:A	SPC862739A	4B	0	0	0	0	0	0
1119:A	GEN862739A	10B	3	0	0	7	0	0
1120:A	GEN862739A	4B	0	0	0	0	0	0
1121:A	GEN862929A	10B	0	0	0	0	2	0
1122:A	GEN862929A	4B	2	0	1	0	0	1
1123:A	GEN865217A	10	0	0	32	0	0	0
1124:A	GEN865217A	4	0	105	0	0	0	0

Figure J-4. Forecast Merge Routine Output
(page 14 of 14 pages)

APPENDIX K

METHODOLOGY TRANSFER

K-1. GENERAL. All of the programs and data used during the implementation phase of this study were written to an ANSI tape and delivered to MTMC. Additionally, either complete or partial printouts corresponding to the tape files were delivered.

K-2. TAPE CONTENTS. The tape delivered to MTMC contained 12 files. Five of the files were program files containing FORTRAN symbolics, executable programs, and some data elements. The remaining seven files were strictly data files. All of the files were separated by end-of-file marks. A brief description of the contents of each tape file appears in Table K-1.

Table K-1. Tape Contents

File number	File name	Type of file	Description
1	G4TWFI	Program	Data screening, reduction; Winters model, forecasts; routines to merge Winters, Box-Jenkins results
2	START*G4TWFIRUNS	Program	Runstream for G4TWFI
3	G49186	Data	Copy of original raw data set supplied by MTMC to CAA for study
4	G4TWFIDAT1	Data	Raw data base after first level of sorting (described in Appendix D)
5	G4TWFIDAT2	Data	Raw data base after second level of sorting (described in Appendix D)
6	G4TWFIDAT3	Data	Raw data base after third and final level of sorting (described in Appendix D)
7	G4TWFIMAN	Data	Contains manual or stipulated forecasts
8	G4TWFIWINDAT	Data	Contains Winters forecasts
9	N7BJ	Program	Contains Box-Jenkins runs for model identification and forecast production
10	N7SHORT	Program	Contains partial output from N7BJ runs, including forecasts
11	N7MTMK	Program	Contains full output from N7BJ runs
12	G4MERGDATA	Data	Contains final merged output from all sources (562 forecasts) (see Appendix J)

APPENDIX L

SPONSOR'S COMMENTS

STUDY CRITIQUE

(This document may be modified to add more space for responses to questions.)

1. Were there any editorial comments? No If so, please list on a separate page and attach to the critique sheet.

2. Was the work accomplished in a timely manner? ________ If not, please comment. ________

3. Does the work report address adequately the issues planned for the analysis? Yes If not, please comment. ________

4. Were appropriate analysis techniques used? Yes If not, please comment. ________

5. Are the findings fully supported by good analysis based on sound assumptions? Yes If not, please explain. ________

6. Does the report contain the preferred level of detail of the analysis? Yes If not, please comment. ________

STUDY CRITIQUE (continued)

7. Is the written material fully satisfactory in terms of clarity of presentation, completeness, and style? Yes If not, please comment.

8. Are all figures and tables clear and helpful to the reader? Yes If not, please comment.

9. Does the report satisfy fully the expectations that were present when the work was directed? Yes If not, please explain how not.

10. Will the findings in this report be helpful to the organization which directed that the work be done? Yes If so, please indicate how, and if not, please explain why not. THE STUDY CONFIRMS SUSPECTED PROBLEM AREAS, HIGHLIGHTS PREVIOUSLY UNSUSPECTED CORRELATIONS, AND WILL BE USED TO JUSTIFY A REQUEST FOR ADDITION OF ONE STATISTICIAN/MATHEMATICIAN.

11. Judged overall, how do you rate the study? (circle one)

Poor Fair Average Good Excellent

APPENDIX M

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GLOSSARY

1. ABBREVIATIONS, ACRONYMS, AND SHORT TERMS

ACF	autocorrelation function
AR	autoregressive (model) Army regulation
ARIMA	autoregressive integrated moving average (model)
ARMA	autoregressive moving average (model)
B-J	Box-Jenkins forecast method
BMDP	Biomedical Computer Programs, P Series
CAA	US Army Concepts Analysis Agency
CONEX	CONEX container
DTS	Defense Transportation System
EEA	essential element(s) of analysis
FY	fiscal year
HQDA	Headquarters, Department of the Army
HHG	household goods
JCS	Joint Chiefs of Staff
MA	moving average (model)
MAC	Military Airlift Command
MILVAN	military container used in transportation
MSC	Military Sealift Command
MSE	mean square error
MTMC	Military Traffic Management Command
MTON	measurement ton(s)
ODCSLOG	Office of the Deputy Chief of Staff for Logistics
PACF	partial autocorrelation function

POD	port of debarkation
POE	port of embarkation
POV	privately owned vehicle
RCM	route-commodity-mode
RMS	root mean square
TWF	transportation workload forecasting
TWFS	Transportation Workload Forecasting Study
W	Winters
W&M	Wheelwright and Makridakis

2. MODELS, ROUTINES, AND SIMULATIONS

Box-Jenkins	A flexible class of linear statistical models that are used to fit stochastic time series data and produce forecasts.
Winters	A seasonal, heuristic, three-parameter exponential smoothing method that iteratively determines the sum of squares of residuals over the data interval.

TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)	STUDY SUMMARY CAA-SR-85-11

<u>THE REASONS FOR PERFORMING THIS STUDY</u> were:

(1) To develop a fiscal year (FY) 86 surface cargo forecast requested by the Military Traffic Management Command (MTMC). Transportation workload forecasts are statements of worldwide peacetime cargo lift requirements which are provided to the Military Sealift Command (MSC) and Military Airlift Command (MAC) by the shipper services. They state requirements in measurement tons by route, commodity, and program.

(2) To assist MTMC in the establishment of an operational forecasting capability using a combination of Box-Jenkins and Winters forecasting methods.

<u>THE PRINCIPAL FINDINGS</u> of the work reported herein are as follows:

(1) The Winters and Box-Jenkins forecasting methods were obtained by MTMC and their personnel trained in the logic and use of the forecasting methods.

(2) The FY 86 long-range surface forecast was produced and delivered to MTMC on 25 March 1985. A forecasting methodology consisting of computer programs and a data benchmark to test the programs was provided to MTMC on 7 June 1985.

(3) Postproduction analysis which utilized backcasting techniques was used to gauge the accuracy of the FY 86 forecast. The root mean square error (based on differences between observations and values predicted from the model) was the initial decision criterion for selecting the "better" forecasts from the two alternate methods.

<u>THE MAIN ASSUMPTION</u> was that the transportation workload forecasting requirements contained in Joint Chiefs of Staff (JCS) Publication 15 would remain unchanged.

<u>THE PRINCIPAL LIMITATION</u> to the forecasting method was that certain route-mode-commodity groups have insufficient shipping frequencies to utilize either the Box-Jenkins or the Winters forecasting methods to obtain usable forecasts.

<u>THE SCOPE OF THE STUDY</u> was to develop and provide an FY 86 long-range, over-ocean surface Army cargo forecast to MTMC and to assist MTMC in implementing a forecast system using the Winters and the Box-Jenkins methods of forecasting recommended by the US Army Concepts Analysis Agency (CAA) in the Transportation Workload Forecasting Study (TWFS).

THE STUDY OBJECTIVES were:

(1) Produce forecasts of 75 percent of the FY 86 ocean cargo requirements using the Box-Jenkins method and 98 percent of the FY 86 ocean cargo requirements using the Winters method.

(2) Assist MTMC to establish a forecasting system to enable them to produce the FY 87 forecast.

THE BASIC APPROACHES were:

(1) To obtain and evaluate cargo-lift data from FY 78 to FY 84 in order to determine which route-commodity-mode combinations occurred frequently enough to provide sufficient data points of monthly tonnages to make valid forecasts of future cargo requirements.

(2) To forecast cargo requirements on the retained routes using both Box-Jenkins and Winters forecasting methods, compare the two forecasts using the root mean square error criterion, and retain the route forecast which had the smaller discrepancies between observed values and those predicted from the model.

(3) To conduct postproduction analysis using backcasting methods which derived a FY 84 forecast for comparison with actual FY 84 movement data.

(4) To provide the forecasts, and the software which produced them, to MTMC to enable MTMC to reproduce the FY 86 forecasts and to use the same methods in future forecasting tasks.

THE STUDY SPONSOR was the Commander, Military Traffic Management Command.

THE STUDY EFFORT was directed by LTC James Keenan; and later, Mr. Harold D. Frear, Force Systems Directorate.

COMMENTS AND QUESTIONS may be addressed to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)	STUDY SUMMARY CAA-SR-85-11

THE REASONS FOR PERFORMING THIS STUDY were:

(1) To develop a fiscal year (FY) 86 surface cargo forecast requested by the Military Traffic Management Command (MTMC). Transportation workload forecasts are statements of worldwide peacetime cargo lift requirements which are provided to the Military Sealift Command (MSC) and Military Airlift Command (MAC) by the shipper services. They state requirements in measurement tons by route, commodity, and program.

(2) To assist MTMC in the establishment of an operational forecasting capability using a combination of Box-Jenkins and Winters forecasting methods.

THE PRINCIPAL FINDINGS of the work reported herein are as follows:

(1) The Winters and Box-Jenkins forecasting methods were obtained by MTMC and their personnel trained in the logic and use of the forecasting methods.

(2) The FY 86 long-range surface forecast was produced and delivered to MTMC on 25 March 1985. A forecasting methodology consisting of computer programs and a data benchmark to test the programs was provided to MTMC on 7 June 1985.

(3) Postproduction analysis which utilized backcasting techniques was used to gauge the accuracy of the FY 86 forecast. The root mean square error (based on differences between observations and values predicted from the model) was the initial decision criterion for selecting the "better" forecasts from the two alternate methods.

THE MAIN ASSUMPTION was that the transportation workload forecasting requirements contained in Joint Chiefs of Staff (JCS) Publication 15 would remain unchanged.

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THE STUDY OBJECTIVES were:

(1) Produce forecasts of 75 percent of the FY 86 ocean cargo requirements using the Box-Jenkins method and 98 percent of the FY 86 ocean cargo requirements using the Winters method.

(2) Assist MTMC to establish a forecasting system to enable them to produce the FY 87 forecast.

THE BASIC APPROACHES were:

(1) To obtain and evaluate cargo-lift data from FY 78 to FY 84 in order to determine which route-commodity-mode combinations occurred frequently enough to provide sufficient data points of monthly tonnages to make valid forecasts of future cargo requirements.

(2) To forecast cargo requirements on the retained routes using both Box-Jenkins and Winters forecasting methods, compare the two forecasts using the root mean square error criterion, and retain the route forecast which had the smaller discrepancies between observed values and those predicted from the model.

(3) To conduct postproduction analysis using backcasting methods which derived a FY 84 forecast for comparison with actual FY 84 movement data.

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THE BASIC APPROACHES were:

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CAA	TRANSPORTATION WORKLOAD FORECASTING STUDY - IMPLEMENTATION (TWFS-I)	STUDY SUMMARY CAA-SR-85-11

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(2) To assist MTMC in the establishment of an operational forecasting capability using a combination of Box-Jenkins and Winters forecasting methods.

THE PRINCIPAL FINDINGS of the work reported herein are as follows:

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